PERIODICAL U.S. National Museum Proceedings
107(3383)
107(33

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No. 3383.—From the Proceedings of the United States National Museum
Vol. 107, pp. 47–105, 8 figs., 14 pls.

SMITHSONIAN INSTITUTION
UNITED STATES NATIONAL MUSEUM
WASHINGTON, D. C.
1957

PROCEEDINGS OF THE UNITED STATES NATIONAL MUSEUM

issued *by the*

SMITHSONIAN INSTITUTION
U. S. NATIONAL MUSEUM

Vol. 107 Washington : 1957 No. 3383

THE FROGFISHES OF THE FAMILY ANTENNARIIDAE

By Leonard P. Schultz

In my attempt to identify fishes for inclusion in the report on "The Fishes of the Marshall and Marianas Islands," I find it impossible to place confidence in the literature describing marine reef fishes of the tropical Indo-Pacific regions unless the genus or the family in which they belong has been revised. Ichthyologists or fishery biologists who have not attempted a revision of a genus of widely ranging marine fishes cannot possibly assess the untrustworthiness of most current faunal lists. To correctly identify as to genus and to species, tropical Indo-Pacific fishes must be considered on a world-wide basis. Those few individuals who have attempted revisions of genera have found a disturbing percentage of the scientific names currently applied to be unreliable. Even a serious attempt at revision of a genus may not clarify the nomenclatorial status of more than 95 percent of the species. The doubtfully identified 5 percent results mostly from the inaccessibility to the author of those types of species preserved in the scattered museums of the world.

The problems of classification and analysis of species and genera encountered in one family are the same as found in many other families that I have studied. In general, there are three such problems.

(1) The characters used in distinguishing species or genera in each family must be carefully evaluated. Only in a general way are the characters of one family reliable for use in another family. It is important to determine for each character its variability, and what reliance can be placed on it for each genus. Frequently this cannot be established until all species have been studied in the family.

Another problem encountered is, (2) what constitutes a genus in the family being revised? Those who have studied many complex fish families know that the limits of a genus are variable. The characters

used for defining genera in one family usually do not apply equally and in the same way in a related family. The genus is partly a subjective category in taxonomy and no doubt will remain of that nature because (a) different values are attributed to distinguishing characters; (b) there is a practical need of relatively more genera in a complex family, composed of very numerous species more or less closely related, than in a less complex family; and (c) in the practice of taxonomy there is brought together under a group name few to many closely related species, which are thought to represent a phyletic line, but whether this line is to be assigned generic or subgeneric level may be decided more or less subjectively.

The characters used in establishing phyletic lines should not be confined to morphological ones. They may be physiological or involve habits and life history, such as are encountered in breeding behavior. The behavior of a species is usually reflected in its morphology. As species diverged in their evolution, the change in behavior probably preceded the morphological change; for example, artificially landlocked races of red salmon have a slower rate of growth, and when maturity is reached they are of a dwarf size. Should this change become inherited we would be dealing with a morphological step in evolution.

The evaluation of generic characters and recognition of genera is possible only when a comprehensive study is made of a family on a world-wide basis and when there is established the nature of the similarities and differences among groups of species. Sometimes fin ray counts (table 1) are useful for this purpose.

To me, a genus is a concept for distinguishing a phyletic line, and it may be represented by one or more species. When a genus includes many species, some of which are a little different from others but agree among themselves and it is difficult to comprehend or to deal with the various smaller phyletic lines, then the genus should be broken into lesser phyletic lines represented by full genera or subgenera, depending on the nature and amount of the variability. The use of subgenera, however, cannot reduce or increase the number of natural phyletic lines. If these occur, and are definable, there is little one can do but recognize them in our system of naming. Thus, it is possible to have a small family overdivided into genera or a large family underdivided into genera. Whatever is done, the nomenclature should serve as a tool for the benefit of other biological disciplines; it should serve as a means of expressing, by names, the groups of species that are closely related and in the same phyletic line.

The problem (3) of how far to progress nomenclatorially in recognizing generic categories must be resolved in a practical manner so that biologists are not presented with a confusion of ill-defined genera.

Usually this confusion and lack of agreement among ichthyologists and fishery biologists results from inadequate studies of a family. Obviously, no dependable solution is possible on how many genera and subgenera to recognize in a family until the zoological relationships of all its species have been adequately compared morphologically, physiologically, and as to habits. No doubt, after this work has been done, a middle of the road or even a conservative attitude on the number of phyletic lines to name would meet with general acceptance. Too often in ichthyology there is a tendency either to unite genera without adequate study or to establish new genera without any attempt to review the family as a whole. The least confusion results if the present status of each genus in a family is retained until such time as it is thoroughly studied.

Let us examine a few current problems as a practical application in recognizing natural phyletic lines for the basis of a genus or subgenus. According to the discussion, a group of closely related species, all of which have one or more common characteristics (morphological, physiological or life history), represents a generic category. Where one phyletic line has two or more such species but a third species differs in one or more tested characters, then I would recognize two full genera or two subgenera, depending on the amount of divergence in the characters tested. Thus, one must evaluate all characters used for each family.

The family Salmonidae illustrates the confusion and diverse thinking on problems of evaluating generic levels. Two well known groups of species are currently referred to the genus *Salmo* in Europe. One group consists of the rainbow trout *Salmo gairdneri*, cutthroat trout *S. clarki*, and Atlantic salmon *S. salar*, among others which may be omitted here. The life history of these trout are much the same; they migrate upstream to spawn in gravel riffles, returning year after year to spawn, and, normally, they do not die after spawning.

The other group of several species is known as the North Pacific salmon, referred to the genus *Oncorhynchus* by North Americans but to *Salmo* by Europeans. Although there are a few minor morphological characters that distinguish these two groups of species, all die after spawning only once. Even if there were no easily observable anatomical features, I would recognize the two distinct phyletic lines as full genera on the basis of the profound genetic differences in the two types of life history.

Another example of current interest involves morphological differences, not life histories. Morton and Miller (Copeia, No. 2, pp. 116–124, pls. 1, 2, 1954) proposed that *Cristivomer* (the lake trout) be considered a synonym of or a subgenus under *Salvelinus*. Although a genus may be originally established on a character that later proves

valueless, such a genus may be adequately distinguished at a later date on the basis of characters not even considered by the original author. That appears to be the case with *Cristivomer*. Morton and Miller have demonstrated very beautifully that *Salvelinus* and *Cristivomer* cannot be generically distinguished by the crested vomer, after which the genus was named. However, they clearly state (p. 122): "We agree with Kendall (1919) that the lake trout represents a line of development distinct from the other chars. Three characters of *Salvelinus namaycush* that are not known to overlap with those of other species of *Salvelinus* are coloration, the position of the dorsal fin and the number of pyloric caeca." In their summary (p. 123) the authors state: "A number of characters readily distinguish *S. namaycush* from all other members of the genus. The best of these, we believe, are color pattern, dorsal-fin position, the deeply forked caudal fin, and the large number of pyloric caeca." Therefore, by the authors own conclusions there are established two phyletic lines, one for *Salvelinus*, with three or more species, and another for the monotypic *Cristivomer*. The remarkably distinct color pattern between the two phyletic lines alone is sufficient to justify subgeneric categories, but with four well established characters generic rank is justified in my opinion.

One of the shortcomings of some generic changes made by authors is the lack of a comprehensive study on a world-wide basis. Actually, the evaluation of generic characters for the Salmonidae must involve Old World genera and species. Had this been done, Morton and Miller's conclusions as well as mine might have been different. This is an example of how the introduction of nomenclatorial changes without a detailed revision of the family leads to confusion.

This discussion bears on my immediate problems: (1) How shall I evaluate the characters observed for the numerous species of Antennariidae, and (2) what level of generic interpretation should I give to each phyletic line? I believe that in evaluating each important character I should consider the evolutionary trend toward its more specialized condition.

Important characters for the Antennariidae are as follows:

1. The skin varies from highly dentigerous to almost naked, and in the most naked species some embedded prickles can be detected microscopically. Naked skin is assumed to be the most specialized condition.

2. The most specialized condition of the gill filaments on the first gill arch is that of greatest reduction, where only one-half the lower part of the first gill arch bears filaments.

3. The most primitive condition of the bait or lure at the tip of the first dorsal spine may be represented by a simple filament. The next step would be the development of a tuft of filaments, followed by specialization into bifid or trifid tentacles.

4. The more numerous and most complex development of dermal cirri all over the body would represent the more specialized condition. These cirri even replace the dermal denticles in one genus.

5. Fin rays present somewhat of a problem but, in general, branched soft rays are assumed to be a more specialized condition than simple soft rays.

6. The more posterior position of the gill opening is considered to represent specialization.

7. The most movable condition of the dorsal spines should represent the more generalized condition, whereas embedded dorsal spines should represent the most specialized.

8. The distinct caudal peduncle is considered more primitive than when the median fins are membranously attached to the base of the caudal fin.

9. Adult antennariids in general have a sedentary habitat. *Histrio* has a sedentary habitat in seaweed but often the seaweed floats pelagically in the ocean. Thus, I consider *Histrio* to be more specialized in its "sedentary" pelagic habitat than the other antennariids.

Using the above characters I have prepared a diagram (fig. 1) suggesting the more important phyletic lines of evolution among the antennariids. Under each generic or subgeneric category are the abbreviations of the anatomical characters showing relationships. Definitions of the abbreviations used are given on page 52, facing figure 1.

The frogfishes, family Antennariidae, may be recognized by their globular-shaped bodies, more or less rough skin caused by minute denticles; pectoral fin limblike; gill opening restricted to a pore near or a little behind the pectoral "elbo"; first dorsal spine, if free, with "bait" or lure at its distal end; second and third spines separate, sometimes embedded or partly covered with skin; a fourth free dorsal spine, completely embedded, followed by the soft dorsal fin; caudal fin rays usually all divided, occasionally one of the outer rays may be simple, and number 4+5; gill rakers poorly developed on first gill arch; gill filaments on first arch greatly reduced on dorsal part of arch or lacking; mouth almost vertical; small conical teeth in rows on jaws, vomer, palatines, and tongue.

In general frogfishes are carnivorous, voracious, and mostly of a sedentary nature. However, *Histrio* will pursue its prey but usually

waits quietly for a fish to swim close enough in a head-on approach, then the attack occurs quickly. The victim is sucked into the big mouth of the frogfish almost instantly, at least quicker than the eye can follow. Often a fish as large as the frogfish is engulfed.

As far as known, frogfishes liberate their eggs in a single long ribbonlike gelatinous mass, which floats like a raft of logs on the way to a sawmill. This gelatinous mass is enormous in proportion to the fish that deposited it.

Before deposition the egg mass lies closely packed in the ovaries, "like a banknote tightly rolled up from its two ends."

Frogfishes have been observed by Drs. Waldo Schmitt and W. H. Longley to inflate their stomachs with air or water, which swells them into an enormous size. A few specimens in the collections of the National Museum are distended with liquid.

The following scientific names are unidentifiable:

Chironectes pavoninus Cuvier and Valenciennes, vol. 12, p. 421, 1837; *C. chlorostygma* Cuvier and Valenciennes, vol. 12, p. 426, 1837.

Lophius spectrum Gray, Catalogue of fish collected and described by Laurence Theodore Gronow, p. 49, 1854 (type locality, Antilles).

Antennarius vulgaris "Cuvier and Valenciennes" *in* Osorio, Jorn. Sci. Math. Phys. Nat. Lisboa, ser. 2, vol. 5, No. 19, p. 198, 1898 (name only; nomen nudum; St. Thomas Island).

Chironectes barbatulus Eydoux and Souleyet, Voyage autour du Monde . . . *La Bonite*, Zool., vol. 1, pt. 2, Poissons, p. 184, pl. 5, fig. 1, 1842 (locality not known but undoubtedly the Pacific).

Photographs of specimens and drawings used in this paper were made by the Smithsonian Institution Photographic Laboratory.

EXPLANATION OF ABBREVIATIONS USED IN FIGURE 1

ads – All dorsal spines long and slender.
ba – Bait absent.
bb – Bait bifid.
bf – Bait filamentous and bulbous.
bs – Bait simple.
bt – Bait trifid.
cpa – Caudal peduncle absent.
cpa-d – Caudal peduncle absent or distinct.
cpd – Caudal peduncle distinct.
dse – All spines embedded.
dsf – Dorsal spines free, movable.
d11–14 or d15–16 – Number of soft dorsal rays.
fds – First dorsal spine long and slender.
gf ¼ – Gill filaments on ¼ of first gill arch.
gf ¾ – Gill filaments on ¾ of first gill arch.
gn – Gill opening normal in position.
gp – Gill opening posterior in position.
pel – Pelagic habitat.
p7 or p8–14 – Number of pectoral fin rays.
sc – Bony scutes present.
sed – Sedentary habitat.
sfd – All soft dorsal rays divided.
sfds – All soft dorsal rays simple.
sf0–2d – Any of last two soft dorsal rays may or may not be divided.
sfpd – Soft rays of pectoral all divided.
sfps – Soft rays of pectoral all simple.
sfvd – Soft rays of pelvic all divided.
sfvs – Soft rays of pelvic all simple.
skc – Skin profusely covered with cirri.
skd – Skin denticulate.
skn – Skin naked.
skvd – Skin with long upstanding denticles or cirri.

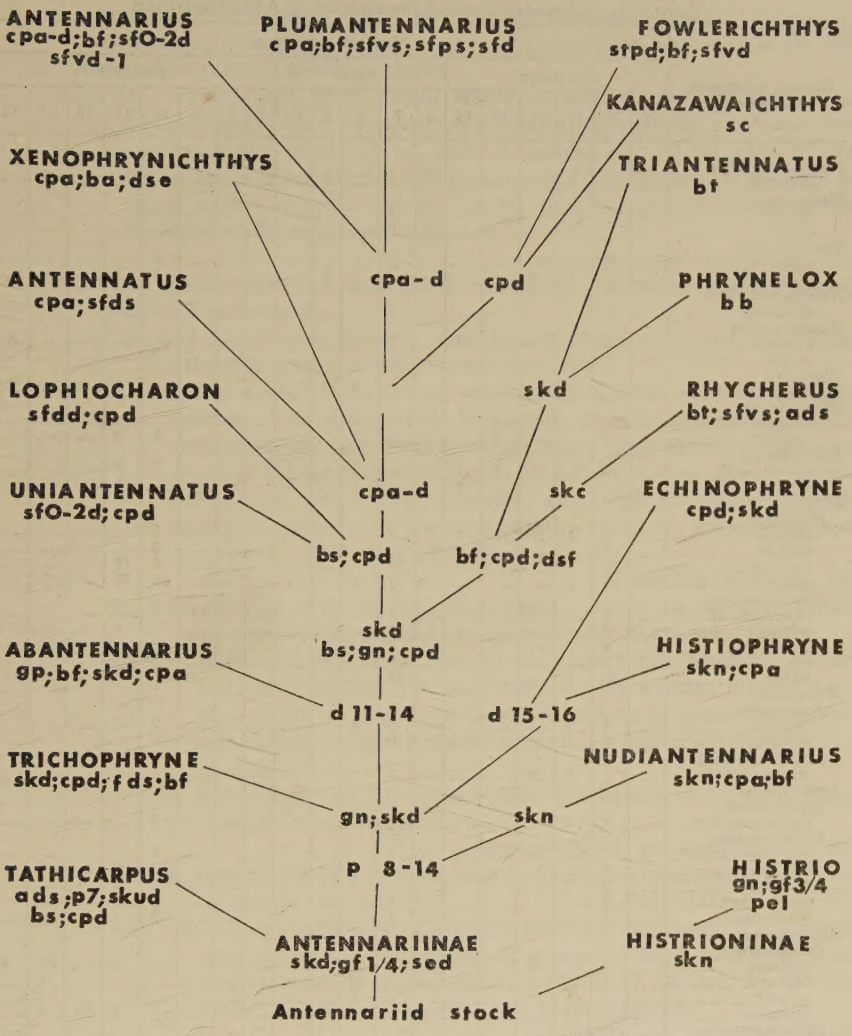

FIGURE 1.—Presumed phylogeny of the Antennariidae. Explanation of abbreviations on facing page.

Artificial key to the genera, subgenera, and species of the Antennariidae

1a. Dorsal part of first gill arch without filaments, ventral part with only anterior half bearing filaments; no dermal cirrus at tip of chin nor on snout in front base of first dorsal spine; a small flaplike cirrus at symphysis of premaxillaries between dentigerous parts . . . (Subfamily Antennariinae.) (p. 62)

2a. Occipital region of head with a thickened and raised bilaterally symmetrical bony armor that extends anteriorly along dorsal edge of orbits; these two scutes are fused along the middorsal line except around the third dorsal spine and its membrane; a similar bony plate below each eye; none of dorsal spines embedded; tip of first dorsal spine consists of a nonfilamen-

TABLE 1.—*Counts recorded for species of* Antennariidae

Genera, subgenera, and species	Number of fin rays																	
	Soft dorsal						Anal					Pectoral						
	11	12	13	14	15	16	6	7	8	9	10	7	8	9	10	11	12	13	14
Kanazawaichthys																			
scutatus			4						3	1								8	
Tathicarpus																			
*butleri**	3							3				3							
butleri	1							1				2							
Trichophryne																			
rosaceus		2						1	1						4				
*mitchelli**			1	2					2	1					1	2			
Nudiantennarius																			
subteres		1						1						2					
Abantennarius																			
duescus		2						2						4					
analis		1						1							2				
Rhycherus																			
*filamentosus**			3						3							3			
Histiophryne																			
*bougainvilli**					3				3				3						
*scortea**					3				3						1	2			
Echinophryne																			
*crassispina**					1	1			2	1	1				1	2			
*glauerti**						1			1							1			
Phrynelox																			
Phrynelox																			
*striatus**		1	1				1	1							2				
*melas**		2					1	1							2				
nuttingi		10						10							2	14			
scaber	1	38	1					39	1						3	59			
Triantennatus																			
cunninghami		1						1						1	1				
zebrinus		6					1	5							10	1			
atra		3						3							6				
nox		3						3							1	5			
tridens		30	1					32								53	2		
Antennatus																			
Antennatus																			
bigibbus		4	3					6	1						2	12			
strigatus		6						6						1	9				
Xenophrynichthys																			
cryptacanthus		1	1					2					2						
Lophiocharon																			
Lophiocharon																			
caudimaculatus		1	5					6						8	2				
Uniantennatus																			
*campylacanthus**	1							1							1				
horridus		1							1							2			
*horridus**		2	2						3	1					1	2	1		
*tenebrosus**		1						1							1				
tenebrosus		1						1							2				
Antennarius																			
Fowlerichthys																			
radiosus		1	75	6					79									99	5
avalonis		1	22						23									44	
*sarasa**			1						1									1	
ocellatus			17						17							3	26	3	
Plumantennatus																			
asper			2					2						4					
Antennarius																			
*oligospilos**		1						1							1				
hispidus		1	3					4							8				
*moluccensis**			2						2							2			
moluccensis			5						5							9			
*leucosoma**		1					1								1				
pardalis	?1								?1						?1				
chironectes	1	7					1	6							13				
multiocellatus	1	5					1	5							11				
*phymatodes**	1	1						2							2				
phymatodes		1						1							2				
sanguineus			7					5	2							11	3		
drombus		15	1					15								7	18	1	
coccineus		21					1	19						2	38	1			
bermudensis		2						2						2	2				
*dorehensis**		1						1						1					
*notophthalmus**		3						3						3	1				
notophthalmus		2						2						3	1				
verrucosus		2						2								4			
altipinnis		18	1					16	3					33	5				
pauciradiatus		13						12	1				2	21	1				
nummifer		22						22							34	4			
Histrio																			
histrio	3	32	2					30	2					2	72	4			

*From literature.

tous bulbous "bait." (Gulf of Mexico; probably pelagic.) (***Kanazawaichthys,*** new genus.) . . . . . **scutatus,** new species (p. 63)

2b. Head without bony armor as above.

3a. First, second, and third dorsal spines embedded, covered over with granular skin; bait not externally visible; soft dorsal and anal fins membranously attached to base of caudal fin; all fin rays simple except those of caudal fin; soft dorsal rays 12 or 13; anal 7; pectoral 8. (East Indies, Karakelang and Rotti Islands) (Genus ***Antennatus, Xenophrynichthys,*** new subgenus.) (p. 81).

cryptacanthus (Weber) (p. 82)

3b. First dorsal spine not embedded, but freely movable, usually bearing bait at its distal tip.

4a. Second dorsal spine slender, elongate, its length contained fewer than 2.8 times in length of base of soft dorsal fin.

5a. Pectoral rays 7; first dorsal spine long, slender, hairlike, smooth, bearing at its tip a simple bannerlike tentacle; third dorsal spine very elongate and slender, much longer than second; unusually elongate upstanding denticles on skin even on fins; all soft dorsal, pelvic, and pectoral rays simple; anal rays all divided; caudal peduncle distinct; all fin rays notably elongate; dorsal soft rays 11; anal 7. (Genus ***Tathicarpus.***) (p. 64)

butleri Ogilby (p. 64)

5b. Pectoral rays 9 to 11; first dorsal spine not as above, third dorsal spine robust, shorter than or same length as second.

6a. (See 6b and 6c.) Skin prickly or covered with granules; caudal peduncle distinct; first dorsal spine very slender, almost hairlike, about as long as or longer than second dorsal spine; first spine bristly and with filamentous tip. (Genus ***Trichophyrne.***) (p. 65)

7a. Soft dorsal rays 12; ocellate dark spot basally at second third of length of soft dorsal fin. (Philippines.)

rosaceus (Smith and Radcliffe) (p. 65)

7b. Soft dorsal rays 13 or 14, skin covered with upstanding spiniform bristles. (Australia.) . . . . . **mitchelli** (Morton) (p. 65)

6b. Skin smooth, at most with only scattered microscopic size denticles; caudal peduncle absent or nearly so; first dorsal spine short with bulbous tip; dorsal soft rays 12; anal 7, pectoral 9. (Philippines.) (***Nudiantennarius,*** new genus.) (p. 66)

subteres (Smith and Radcliffe) (p. 66)

6c. Skin without denticles but these are replaced by a profusion of fleshy tentacles or cutaneous appendages everywhere; bait trifid, two large tentacles with a stubby one basally between them; last pelvic ray simple; soft dorsal rays 13; anal 8; pectoral 11. (Southern Australia.) Genus ***Rhycherus.***)

filamentosus (Castelnau) (p. 68)

4b. Second dorsal spine robust like the third, short, its length contained 3 or more times in the length of base of soft dorsal fin.

8a. Gill opening behind pectoral fin "elbo" by a distance equal to or greater than least depth of the indistinct caudal peduncle; soft dorsal rays 12; anal 7. (***Abantennarius,*** new genus.) (p. 66)

9a. Gill opening about halfway between pectoral fin base and anal fin origin, pectoral rays 9. (Hawaiian Islands.)

duescus (Snyder) (p. 66)

9b. Gill opening adjacent to anal fin origin; pectoral rays 10. (Hawaiian Islands.) . . . **analis** Gosline, new species (p. 67)

8b. Gill opening adjacent to pectoral fin "elbo."

10a. Soft dorsal rays 15 or 16.

11a. Skin smooth, at most with only microscopic size spicules; caudal peduncle absent; none of soft rays of dorsal or anal fins divided. (Genus ***Histiophryne.***) (p. 69)

12a. Pectoral rays 8; second and third dorsal spines not movable, covered with thick skin. (Southern Australia.) **bougainvilli** (Cuvier and Valenciennes) (p. 69)

12b. Pectoral rays 10 or 11; second and third dorsal spines movable. (Southern Australia.) **scortea** McCulloch and Waite (p. 69)

11b. Skin everywhere covered with bristles; caudal peduncle distinct or nearly so; anal rays 8 to 10; pectoral 10 or 11. (Genus ***Echinophryne.***) (p. 70)

13a. First dorsal spine stout, covered with prickles; body covered with upstanding bristles; none of soft dorsal or anal rays divided. (Southern Australia.) **crassispina** McCulloch and Waite (p. 70)

13b. First dorsal spine slender, smooth, with simple tentacle, last few soft dorsal rays and anal rays divided. (Western Australia.) . . . . . **glauerti** Whitley (p. 70)

10b. Soft dorsal rays 11 to 14.

14a. Fleshy tip of first dorsal spine consists of distinct bifid or trifid tentacles, often with filaments, but usually without basal filaments, anal rays 6 or 7; last 2 or 3 rays of soft dorsal divided; all anal rays divided; all pectoral rays simple; caudal peduncle distinct. (Genus ***Phrynelox.***) (p. 71)

15a. Bifid tentacles at tip of first dorsal spine; dorsal soft rays usually 11 or 12, rarely 13; pectoral 10 or 11. (Subgenus ***Phrynelox.***) (p. 71)

16a. Bony part of first dorsal spine almost twice length of second dorsal spine.

17a. Body striped with brown markings more or less resembling a zebra. (Tropical Western Pacific and Indian Ocean.) . . . . . **striatus** (Shaw) (p. 71)

17b. Body with ocellate spots and somewhat mottled or plain blackish. (Tropical Western Pacific and Indian Ocean.) . . . . . **melas** (Bleeker) (p. 72)

16b. Bony part of first dorsal spine only slightly longer or about same length as second dorsal spine.

18a. Color plain black or dark brown. (Western Atlantic.) **nuttingi** (Garman) (p. 72)

18b. Body striped with dark brown markings resembling a zebra; fins with dark brown spots. (Western Atlantic.) . . . . . **scaber** (Cuvier) (p. 73)

15b. Trifid tentacles at tip of first dorsal spine (rarely is one of these tentacles missing from injury); dorsal soft rays usually 12. (***Triantennatus,*** new subgenus.) (p. 74)

19a. Pectoral rays 10, occasionally 9 or 11.

20a. Body striped with dark brown markings on a pale background, more or less zebralike.

21a. About 4 to 6 dark stripes on soft dorsal fin, and other widely spaced ones on body; pectoral rays 9 or 10. (Hawaii.) . . . . **cunninghami** (Fowler) (p. 74)

21b. Dark stripes on fins and body very numerous and closely packed; pectoral rays 10, occasionally 11. (Australia.) . . . . **zebrinus,** new species (p. 75)

20b. Color black; fin rays notably black, not white-tipped, except pectorals are slightly pale. (Sydney, Australia.) . . . . . **atra,** new species (p. 76)

19b. Pectoral rays 11, occasionally 10.

22a. Color black, or dark brown; pectoral rays white-tipped. (Japan.) . . . . . **nox** (Jordan) (p. 78)

22b. Color mottled or striped with dark brown; fins and belly dark-spotted. (Japan; Mauritius.) **tridens** (Temminck and Schlegel) (p. 79)

14b. Fleshy tip of first dorsal spine consists of a simple tentacle or is filamentous or bulbous with or without filaments or a combination of any of these.

23a. Bony part of first dorsal spine notably slender, its fleshy tip consisting of a nonfilamentous simple slender tentacle, sometimes somewhat lanceolate.

24a. Caudal peduncle absent, or indistinct.

25a. All rays of soft dorsal simple; skin thick and firm, covered with shagreenlike denticles; third dorsal spine bound down with skin; no naked area behind second or third dorsal spines; body mottled with brown or a very coarse network of brown; usually a dark bar across anal fin and basally across caudal fin. (***Antennatus,*** new genus and new subgenus.) (p. 80)

26a. Pectoral rays 11, occasionally 10; first dorsal spine notably longer than second dorsal spine. (Central and Western Pacific and Indian Ocean.) **bigibbus** (Lacepède) (p. 80)

26b. Pectoral rays usually 10, occasionally 9; first dorsal spine about same length as second dorsal spine. (Eastern Pacific.) . . . **strigatus** (Gill) (p. 81)

25b. Dorsal soft rays all divided; no pelvic ray divided; body rather profusely covered with dark specks and irregularly shaped dark and light marks; pectoral rays usually 9, occasionally 10; anal 7. (Eastern and Western Pacific and Indian Ocean.) (Genus and subgenus ***Lophiocharon.***) **caudimaculatus** (Rüppell) (p. 82)

24b. Caudal peduncle distinct; third dorsal spine movable; last 2 or 3 or none of the soft dorsal rays divided; pectoral rays 10 to 12. (***Uniantennatus,*** new subgenus.) (p. 83)

27a. Bony part of first dorsal spine shorter than second dorsal spine; dorsal soft rays 11; pectoral 10; anal 7; median fins with several large ocellate spots; 3 large ocellate spots on each side of the body; last 3 soft dorsal rays divided. (Guinea, West Africa.) **campylacanthus** (Bleeker) (p. 85)

27b. Bony part of first dorsal spine as long as or longer than second dorsal spine; dorsal soft rays 12 or 13; pectoral rays 10 to 12; only last 2 or 3 soft dorsal rays divided.

28a. Anal rays 8 or 9; color dark brown, spotted with blackish; some ocellate spots present. (Tropical Central and Western Pacific.)
horridus (Bleeker) (p. 84)

28b. Anal rays 7; color brownish, marbled with bright yellow when alive; pectoral, dorsal, anal, and caudal fins with several distinct ocellate spots (Western Atlantic.) . . . . **tenebrosus** (Poey) (p. 83)

23b. Fleshy tip of first dorsal spine consists of a group of filaments or a ribbonlike tentacle with filaments or tentacles or a bulbous tip or combination of these. (Genus ***Antennarius.***) (p. 85.)

29a. All or at least last 8 of the soft dorsal rays divided.

30a. All of the pelvic soft rays divided; caudal peduncle distinct, bait consists of a tuft of tentacles or a bulbous-like bait; soft dorsal rays usually 13; anal 8. (Subgenus ***Fowlerichthys.***) (p. 86.)

31a. Bony part of first dorsal spine longer than second dorsal spine; pectoral rays 13 or 14, undivided; soft dorsal fin rays all divided; an ocellate spot basally a little behind middle of length of soft dorsal fin; bulbous tip of bait usually very small. (Western Atlantic.) . . . **radiosus** Garman (p. 87)

31b. Bony part of first dorsal spine shorter than or about as long as second dorsal spine; all pectoral rays divided except possibly in *sarasa*.

32a. Pectoral rays 13.

33a. Soft dorsal rays all divided except possibly first 2 or 3 in small specimens; an ocellate spot posterobasally on soft dorsal fin; scattered brown spots on fins and body. (Catalina Island; México; Panamá; Perú.)
avalonis Jordan and Starks (p. 87)

33b. First 5 soft dorsal rays may be undivided, at least the last 8 are divided; no ocellate spot on soft dorsal; coloration consists of dark brown background overlaid with reticulations and dark streaks. (Japan.) . **sarasa** Tanaka (p. 88)

32b. Pectoral rays usually 12, occasionally 11 or 13; a large ocellate spot basally on middle of soft dorsal fin and one below it on midside of body; usually tiny dark brown spots scattered on body; caudal fin with or without a large ocellate spot; all of soft dorsal, pelvic, and pectoral rays branched. (Western Atlantic.)
ocellatus (Bloch and Schneider) (p. 89)

30b. Pelvic rays all simple or undivided; caudal peduncle absent; pectoral rays 9; dorsal soft rays 13; body profusely marked with small brown spots or blotches

on a pale background, some of these dark blotches have pale centers on caudal fin or color is plain black with tips of rays white; median fins distally broadly margined with white. (Australia, Singapore.) (***Plumantennatus,*** new subgenus.) (p. 89)

asper Macleay (p. 89)

29b. None or only last 2 or 3 rays of soft dorsal are divided; none or only last pelvic ray divided; pectoral rays all simple. (Subgenus ***Antennarius.***) (p. 90)

34a. Some "warts" on skin; none of the anal, dorsal or pelvic rays are branched or divided; dorsal rays 11 or 12; anal 7; pectoral 10. (Western Pacific.)

phymatodes Bleeker (p. 90)

34b. No "warts" on skin; all anal rays divided except possibly the first.

35a. None of the soft dorsal rays are branched or divided; last pelvic ray probably divided; bony part of first dorsal spine slightly longer than second dorsal spine and bearing a tuft of tentacles at its distal tip; dorsal rays 11 or 12; anal 7; pectoral 9 or 10.

36a. Dorsal rays usually 11; caudal peduncle distinct; body and fins with several black ocellate spots; body, including abdomen, with numerous small blackish spots; background color reddish brown. (West coast of Africa.)

pardalis (Cuvier and Valenciennes) (p. 92)

36b. Dorsal rays 12; caudal peduncle almost absent; a single large ocellate spot at beginning of last third of length of soft dorsal base, this spot more on body than on dorsal fin; body and fins speckled with tiny dark spots. (Bermuda.)

bermudensis, new species (p. 98)

35b. Last 2 or 3 soft dorsal rays divided, except none may be divided in *multiocellatus.*

37a. Bony part of first dorsal spine longer than second dorsal spine.

38a. Body without "warts" on skin.

39a. Body striped with black or brown marks, more or less zebralike; bony part of first dorsal spine about same length as second dorsal spine, the fleshy tip consists of an elongate filamentous tentacle; an ocellus may occur basally in soft dorsal fin; dorsal rays 13; anal 7; pectoral 10. (Philippines, East Indies, Japan.)

hispidus (Bloch and Schneider) (p. 90)

39b. Body not striped like a zebra.

40a. Dorsal soft rays 13; anal 8; pectoral 11; large adults have a profusely black spotted and reticulated color pattern, or it may be mottled light and dark with scattered tiny black specks; small specimens have a few ocellate spots on fins and

body; no smooth pit behind second dorsal spine. (Tropical Pacific.)
moluccensis Bleeker (p. 91)

40b. Dorsal soft rays 11 or 12; anal 6 or 7; pectoral 10.

41a. Color white or nearly so, finely peppered with dark dots on body and fins. (Western Pacific.)
leucosoma Bleeker (p. 92)

41b. Color not as above; two color phases occur or a combination of these may occur; one is black with tips of rays of paired fins white; the other color phase is usually mottled light brownish and marked with ocellate spots; occasionally ocellate spots are visible in the black color phase; bait usually consists of a ribbonlike tentacle with filaments, or a tuft of filaments.

42a. Abdomen with scattered but numerous small blackish ocellate spots in pale color phase; naked area behind the second dorsal spine becomes denticulate on the large adults of this species; no dark spot each side of third dorsal spine. (Indo-Pacific.)
chironectes Lacepède (p. 93)

42b. Abdomen unspotted in pale color phase, a black spot basally each side of third dorsal spine; in black color phase a whitish spot on dorsal edge of caudal peduncle just behind rear of base of soft dorsal. (Western Atlantic.)
multiocellatus (Cuvier and Valenciennes) (p. 94)

38b. Body with some warts; last 3 soft dorsal rays divided; caudal peduncle distinct, longer than deep; dorsal 12; anal 7; pectoral 10; no pelvic ray branched. (Western Pacific and Indian Ocean.)
oligospilos Bleeker (p. 95)

37b. Bony part of first dorsal spine about as long as or shorter than second dorsal spine.

43a. Body striped with dark brown, more or less zebralike; dorsal rays 12 or 13; anal 7; pectoral 10, rarely 11 (Western Pacific and Indian Ocean.) . **hispidus** (Bloch and Schneider) (p.90)

43b. Body not striped like a zebra; anal rays 7 or 8.

44a. Soft dorsal rays 13; pectoral 11 or 12; anal 7 or 8; belly with scattered blackish or dark brown spots (absent in young) notably much larger than dark spots elsewhere if latter were present; fleshy tip of first dorsal

spine with some blackish tentacles; only last 2 or 3 soft dorsal and last pelvic rays branched; caudal peduncle scarcely present. (Eastern Pacific.) . . . . **sanguineus** Gill (p. 95)

44b. Soft dorsal rays normally 11 or 12, rarely 13; anal rays normally 7, occasionally 8.

45a. Caudal peduncle absent or scarcely present, dorsal and anal fins join at or very close to base of caudal fin rays; dorsal rays 12; last two or three rays of soft dorsal divided; last pelvic ray divided.

46a. No ocellate spot in soft dorsal.

47a. Pectoral rays 11 or 12; median fins finely brown spotted; background color brownish to light brownish, mottled or finely spotted. (Hawaii; Cocos Island.)

drombus Jordan and Evermann (p. 96)

47b. Pectoral rays 10, occasionally 9 or 11; body sometimes profusely peppered with dark dots. (Central and West Pacific and Indian Oceans.)

coccineus (Lesson) (p. 97)

46b. A single large occellate spot at beginning of last third of length of soft dorsal, this spot more on body than on dorsal fin; body and fins speckled with tiny dark spots; pectoral 9 or 10. (Bermuda.)

bermudensis, new species (p. 98)

45b. Caudal peduncle present, distinct.

48a. Color black; body with minute white specks; no ocellate spot; dorsal 12; anal 7; pectoral 9; last pelvic ray undivided. (Western Pacific.)

dorehensis Bleeker (p. 97)

48b. Color not as above.

49a. Last pelvic ray simple or undivided; pectoral rays 9, rarely 10; ocellate spot on soft dorsal fin, blackish bar on body below area between third dorsal spine and origin of soft dorsal. (Western Pacific.)

notophthalmus Bleeker (p. 99)

49b. Last or fifth pelvic ray divided.

50a. Pectoral rays 11; color pattern consisting of brown streaks and blotches, some of which have pale centers. (Western Atlantic.)

verrucosus Bean (p. 99)

50b. Pectoral rays normally 9 or 10.

51a. Pectoral rays usually 9, occasionally 10.

52a. General coloration dark brown and somewhat dark spotted but cirri on body are usually white; median fins notably dark brown except distally with broad white or pale edges; a pale bar across caudal fin basally. (Western Pacific.)
altipinnis Smith and Radcliffe (p. 99)

52b. General coloration light brown with a very small ocellate spot at about beginning of last third of length of soft dorsal base, this spot more on dorsal fin than on body. (Florida and Cuba.)
pauciradiatus, new species (p. 100)

51b. Pectoral rays normally 10, occasionally 11; usually an ocellate spot basally on soft dorsal fin at about beginning of last third of its length; background color light tan to dark brown, usually somewhat mottled; a smooth pit or area behind second dorsal spine. (Central and Western Pacific; Indian Ocean.)
nummifer (Cuvier) (p. 102)

1b. Dorsal part of first gill arch with the posterior half only bearing filaments; ventral part of first gill arch with gill filaments along its entire length; two dermal cirri on middorsal line of snout in front of base of first dorsal spine; dermal flap at symphysis of premaxillaries absent or represented by a low fold of skin. (Subfamily Histrioninae; genus ***Histrio*** pelagic in Atlantic, Pacific, and Indian Oceans.) . . . . . **histrio** (Linnaeus) (p. 103)

Family ANTENNARIIDAE

Subfamily ANTENNARIINAE

Kanazawaichthys, new genus

GENOTYPE: *Kanazawaichthys scutatus,* new species.

This new genus of antennariid differs from all other genera in the family by having two pairs of bony plates on the head. The largest pair covers all of the dorsoposterior part of the head behind and above orbits. A small plate is below each eye. Otherwise this genus has the characters of *Antennarius.*

The genus is named in honor of Robert H. Kanazawa, museum aide in the Division of Fishes, U. S. National Museum (USNM),

who observed three unique specimens while sorting specimens from the *Oregon* collections and kindly brought them to my attention.

Kanazawaichthys scutatus, new species

PLATE 14,A

HOLOTYPE: USNM 157919, from Gulf of Mexico, *Oregon* Station 1273, long. 87°51′ W., lat. 28°10′ N., Mar. 9, 1955. Probably picked up in a dipnet near surface. Standard length 28.5 mm.

PARATYPES: USNM 157920, collected with holotype and bearing same date, two specimens, 15.8 and 29.5 mm.; USNM 174946, Gulf of Mexico, Oregon Station 1370, long. 88°00′ W., lat. 28°55′ N., Aug. 20, 1955, taken from stomach of yellowfin tuna, standard length 17 mm.

DESCRIPTION: Certain counts are recorded in table 1 (p. 54).

The bony part of the first dorsal spine, slightly shorter than the second, bears at its tip the fleshy bait which consists of a nonfilamentous bulb; the second and third spines are movable but membranously connected to the head; all soft rays of anal, caudal, and pelvic are branched; last 10 to 12 soft dorsal rays branched; pectoral rays all simple; gill opening close to pectoral fin base; caudal peduncle distinct, deeper than long; skin with tiny denticles somewhat embedded; dermal cirri scattered on body and head.

Detailed measurements were made on the holotype and two paratypes and these data, expressed in thousandths of the standard length, are recorded respectively. Standard length 28.5, 29.5 and 15.8 millimeters. Greatest depth of body 592, 572 and 634; length of bony part of first dorsal spine 202, 190 and 165; of second 158, 167 and 146, of third 173, 190 and 158; longest soft dorsal ray 271, 248 and 215; longest middle caudal ray 394, 404 and 462; length of head from snout tip to middle of gill opening 611, 596, and 620; length of maxillaries 252, 228 and 203; least depth of caudal peduncle 128, 114 and 127; length of caudal peduncle 94, 86 and 64; length of base of soft dorsal fin 518, 500 and 506; diameter of eye 128, 133 and 127; bony width of interorbital space 99, 95 and 108.

COLOR IN ALCOHOL: Fins, head, and body light straw colored; body with scattered dark pigment spots; fins probably pink when alive as there are traces of that color still evident.

REMARKS: This remarkable new species of frogfish is unlike any other antennariid known to me by having the remarkable bony scutes or armor on the head. I suspect this species is pelagic and that these thickened bony plates act as a floating mechanism. Consideration was given to the possibility that this species might represent the young stage of some known species of frogfish and that at a later stage these plates might be lost.

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The four species referred to the subgenus *Fowlerichthys* are closest to *Kanazawaichthys scutatus* in regard to most characters except the lack of bony plates. Anal, dorsal, and pelvic soft rays all divided, and also identical in number. *A. avalonis* and *A. sarasa* are from the Pacific, but *A. radiosus* and *A. ocellatus* are from the Western Atlantic. Our large series of *A. radiosus* includes the sizes of the types of *K. scutatus*, and no bony armor is present on the head even though pectoral rays are of same number.

A. ocellatus, with the usual number of 12 pectoral rays occasionally 11 or 13, differs from *K. scutatus*, which has 13. Furthermore, specimens of *A. ocellatus* from the Gulf of Mexico measuring 22 and 26 mm. show no sign of any bony plate. Other specimens of *A. ocellatus* ranging in size from 15.5 mm. and longer show no trace of the plates which characterize *K. scutatus*.

We conclude, therefore, that this new genus and species represents a phyletic line differing from all other genera in the family.

The species is named *scutatus* in reference to the bony scutes on the head.

Genus *Tathicarpus* Ogilby

Tathicarpus Ogilby, Proc. Roy. Soc. Queensland, vol. 20, p. 19, Jan. 2, 1907 (genotype, *Tathicarpus butleri* Ogilby).

This genus is characterized by having a simple tentacle at tip of first dorsal spine in combination with a distinct caudal peduncle, none of the soft dorsal or pelvic rays branched, and seven pectoral fin rays.

Tathicarpus butleri Ogilby

PLATE 1,A

Tathicarpus butleri Ogilby, Proc. Roy. Soc. Queensland, vol. 20, p. 20, Jan. 2, 1907 (type locality, Port Curtis, east coast of Queensland).

Tathicarpus mucosum Ogilby, Proc. Roy. Soc. Queensland, vol. 20, p. 22, 1907 (type locality, Port Curtis, Queensland).

Tathicarpus appeli Ogilby, Mem. Queensland Mus., vol. 7, pt. 4, p. 303, pl. 19, fig. 2, 1922 (type locality, Wide Bay, South Queensland).

This is the only known species of antennariid with only seven pectoral rays. *A. butleri* is characterized by the unusually elongate denticles of the skin, which even occur as spinules on the fins; all fin rays are unusually elongate for an antennariid, especially the second and third dorsal spines, which are elongate and slender; the first dorsal spine is long and threadlike, bearing at its tip a simple slender tentacle; these somewhat extreme characters no doubt were the reason Ogilby established the genus *Tathicarpus* for this species.

The only specimen that I have studied (USNM 164195 from Jarape, north coast of Groote Eylandt, North Australia, collected by Robert R. Miller) has the soft dorsal fin damaged, but all rays appear to be simple; none of the pelvic or pectoral rays are divided; anal rays all divided; no naked area behind second dorsal spine; the length of the latter contained 2¾ times in base of soft dorsal; caudal peduncle distinct.

Genus *Trichophryne* McCulloch and Waite

Trichophryne McCulloch and Waite, Rec. Australian Mus., vol. 1, No. 1, p. 68, 1918 (genotype *Antennarius mitchelli* Morton).

This genus is characterized by the long slender second dorsal spine, the length of which is contained 2.8 or fewer times in the length of the base of the soft dorsal fin. In most species of antennariids the second dorsal spine is embedded or short and robust and contained more than 3½ times in length of base of soft dorsal fin.

Trichophryne rosaceus (Smith and Radcliffe)

PLATE 1,B

Antennarius rosaceus Smith and Radcliffe, *in* Radcliffe, Proc. U. S. Nat. Mus., vol. 42, p. 203, pl. 17, fig. 2, 1912 (type locality, Romblon, Philippine Islands; holotype, USNM 70266).

This distinctive species may be recognized by the long slender rough second dorsal spine and the still longer threadlike first dorsal spine with a bulbous tuft of filaments at its tip. It differs from its closest relative, *A. mitchelli*, in having 12 dorsal soft rays instead of 13 or 14, last 2 or 3 soft dorsal rays divided, last pelvic ray divided, and all anal rays divided.

Two specimens of this species are known—the holotype, and another specimen measuring 13.5 mm. in standard length from Bikini Atoll, USNM 113991.

Trichophryne mitchelli (Morton)

PLATE 1,C

Antennarius mitchelli Morton, Papers Proc. Roy. Soc. Tasmania 1896, p. 98, July 1897 (type locality, East Coast, Tasmania).

Trichophryne mitchelli McCulloch and Waite, Rec. Australian Mus., vol. 1, No. 1, p. 68, pl. 6, fig. 1, 1918 (Brighton Beach, South Australia; off Wilson's Promontory, Victoria).—Waite, The fishes of South Australia, p. 211, fig. 303, 1923 (South Australia).

I have not seen a specimen of this species. It is known from the records listed in the synonymy.

The figure by McCulloch and Waite shows none of the dorsal, anal, pectoral, or pelvic rays divided; caudal peduncle distinct; first dorsal ray long, slender, spinate, with dermal tentacles at its tip.

Nudiantennarius, new genus

GENOTYPE: *Antennarius subteres* Smith and Radcliffe.

This new genus is characterized by having naked skin or almost naked skin with only microscopic sized embedded denticles scattered on head and body in combination with a long slender second dorsal spine; short first dorsal spine with bait consisting of a tuft of tentacles.

The genus is named in reference to an antennariid with naked skin.

Nudiantennarius subteres (Smith and Radcliffe)

PLATE 1,D

Antennarius subteres Smith and Radcliffe, *in* Radcliffe, Proc. U. S. Nat. Mus., vol. 42, p. 205, pl. 17, fig. 1, 1912 (type locality, Lingayen Gulf, Philippines; holotype, USNM 70268).

This species is characterized by having an almost naked skin, with only microscopic size denticles scattered in the skin; first dorsal spine short, the bait consisting of a tuft of tentacles; last three soft dorsal rays divided; anal rays divided; pelvic and pectoral rays all simple; second dorsal spine long and slender, covered with numerous denticles, its length a little over twice in base of soft dorsal; third dorsal spine with free tip, but mostly bound down with skin, denticles only present on free portion; caudal peduncle present; background color brown, mottled with darker brown; tips of rays of median fins white; pectoral rays with distal half free or excerted beyond membranes (drawing of holotype is in error in regard to that character).

This species is known only from the holotype, which I have studied.

Abantennarius, new genus

GENOTYPE: *Antennarius duescus* Snyder.

This new genus is characterized by having the gill opening remote from the "elbo" of the pectoral fin. The gill opening is considerably behind the usual position. Other characters are indistinct caudal peduncle, no pelvic or pectoral ray divided, last two soft dorsal rays divided, and all anal rays divided. The bait consists of a tuft of filaments.

The genus is named in reference to an antennariid with the gill opening remote from or away from its usual position near the base of pectoral fin.

Abantennarius duescus (Snyder)

PLATE 2,A

Antennarius duescus Snyder, Bull. U. S. Fish Comm., vol. 22, p. 537, pl. 13, fig. 24, 1904 (type locality, *Albatross* Station 3872, Auan Channel, 32 to 43 fathoms, between Maui and Lanai; holotype, USNM 50884; paratype, USNM 126597,

Albatross Station 4128, near Kauai in 75 fathoms); *ibid.*, vol. 23, p. 522, pl. 65, fig. 2, 1905 (channel between Maui and Lanai; Kauai).

This species has the gill opening on the side of the body remote from the "elbo" of the pectoral fin; the first dorsal spine is about same length as second dorsal spine and bears a tuft of filaments; no naked area behind second dorsal spine; caudal peduncle scarcely present; third dorsal spine movable.

I have studied the holotype and paratype.

Abantennarius analis Gosline, new species

FIGURE 2

HOLOTYPE: USNM 164419, Oahu, Waikiki reef, Dec. 31, 1952, Gosline and Randall, standard length 44 mm.

DESCRIPTION: The following counts were made on the only known specimen: Dorsal I–I–I,12; anal 7; pectoral 10 in both fins.

The following measurements are recorded in thousandths of the standard length: Greatest depth of body 586; length of bony part of first dorsal spine 202; of second dorsal spine 136; of third 159; longest soft dorsal ray 257; longest (middle) caudal ray 230; length of maxillaries 180; least depth of caudal peduncle 91; length of caudal peduncle or distance between vertical lines thru caudal fin base and rear bases of anal fin 34; length of base of soft dorsal fin 530; fleshy eye diameter 86; fleshy interorbital space 105; tip of snout to center of gill opening 898.

The bony part of the first dorsal spine is notably longer than the second, and bears at its tip the fleshy bait which consists of one large fleshy tentacle with a tuft of cirri on opposite side basally; skin behind base of second dorsal spine naked; second dorsal spine movable, but third is bound down with skin of body; soft dorsal rays all simple except last two, which are divided; none of pelvic or pectoral rays divided; anal rays divided; gill opening just above origin of anal fin; caudal peduncle very short, only a little distinct, much deeper than long; skin everywhere thickly covered with the usual bifid and trifid prickles; dermal cirri along lateral line and others on head.

COLOR IN ALCOHOL: Background color brown, overlaid with numerous small darker brown flakelike marks somewhat reticulated ventrally; there is a tiny black spot about an eye diameter behind eye and another on the midside a little in front and above pectoral fin base; a less distinct black spot occurs on the back near base of first soft dorsal ray; caudal, pelvic, and pectoral fins barred; edges of dorsal and anal fins pale.

REMARKS: This new species differs from the only other member of the genus, *A. duescus*, in having 10 pectoral rays instead of 9; the gill opening is opposite the anal origin instead of halfway between pectoral

FIGURE 2.—*Abantennarius analis* Gosline, new species. Drawing by Mrs. D. B. Schultz of holotype, USNM 164419, from Waikiki, Oahu Island, Hawaii.

base and anal origin; first dorsal spine or "bait" is longer than second dorsal instead of same length; and there is a naked area behind base of second dorsal spine instead of prickly skin.

The species is named *analis* in reference to the location of the gill opening at origin of anal fin.

This species was recognized as new by Dr. Gosline, who kindly permitted me to include and describe it in this revision.

Genus *Rhycherus* Ogilby

Rhycherus Ogilby, Proc. Roy. Soc. Queensland, vol. 20, p. 17, 1907 (genotype, *Rhycherus wildi* Ogilby = *Chironectes filamentosus* Castelnau).

This genus is characterized by the absence of denticles in the skin, these are replaced by a profusion of fleshy tentacles or cutaneous appendages everywhere; the bait consists of two fleshy tentacles with a third small one between basally; all other antennariids with trifid tentacles forming the bait have the skin profusely denticulate and the last pelvic ray divided, but in this genus it is undivided.

Rhycherus filamentosus (Castelnau)

PLATE 2,B

Chironectes filamentosus Castelnau, Proc. Zool. Acclim. Soc. Victoria, vol. 1, p. 244, 1872 (type locality, St. Vincent Gulf, southern Australia).

Chironectes bifurcatus McCoy, Prodr. Zool. Victoria, vol. 2, dec. 13, p. 87, pl. 123, 1886 (type locality, Brighton Shore, Victoria).

Rhycherus wildi Ogilby, Proc. Roy Soc. Queensland, vol. 20, p. 18, 1907 (type locality, "Southern Australia" [Victoria]).

Rhycherus filamentosus McCulloch and Waite, Rec. Australian Mus., vol. 1, No. 1, p. 70, fig. 31, pl. 6, fig. 3, 1918 (Kangaroo Island; St. Vincent Gulf; Corny Point, and Palmerston, South Australia); Waite, The fishes of Southern Australia, p. 208, fig. 299, 1923 (South Australia).

This species is characterized by the profusion of fleshy tentacles, tubercles, or cutaneous appendages on head, body, and fins, along with the absence of the usual denticles in the skin; first dorsal spine long, slender, much longer than second dorsal spine, the bait consisting of two fleshy tentacles, with a small knob between them basally; second and third dorsal spines long, slender, and covered with tentacles; last soft rays of dorsal divided; anal rays probably all divided; pelvic and pectoral rays all simple; caudal peduncle distinct.

I have not seen a specimen of this species.

Genus *Histiophryne* Gill

Histiophryne Gill, Proc. U. S. Nat. Mus., vol. 1, p. 222, 1879 (genotype, *Chironectes bougainvilli* Cuvier and Valenciennes.)

This genus is characterized by having smooth skin or at most only microscopic size denticles; caudal peduncle absent, the dorsal and anal membranously attached to base of caudal fin; none of the dorsal, anal, pelvic, or pectoral rays divided; and with 15 or 16 soft rays in dorsal fin.

Histiophryne bougainvilli (Cuvier and Valenciennes)

PLATE 2,C

Chironectes bougainvilli Cuvier and Valenciennes, Histoire naturelle des poissons, vol. 12, p. 431, 1837 (type locality not known).

Histiophryne bougainvilli, McCulloch and Waite, Rec. South Australian Mus., vol. 1. No. 1, p. 72, pl. 7, fig. 1, 1918 (St. Vincent Gulf, South Australia); Waite, The fishes of South Australia, p. 209, fig. 300, 1923 (South Australia).

This species has a tiny short naked first dorsal spine with a tiny bulbous "bait"; second and third dorsal spines bound down with skin; all rays of soft dorsal, anal, pelvic, and pectoral fins simple; soft dorsal and anal fins membranously attached to base of caudal fin rays; skin with microscopic sized denticles or almost smooth; the presence of 15 soft dorsal rays distinguishes this species from all antennariids except two other species, *scortea* and *crassispina*, which have smooth skin without prickles.

I have not seen a specimen of this species.

Histiophryne scortea McCulloch and Waite

PLATE 2,D

Histiophryne scortea McCulloch and Waite, Rec. South Australian Mus. vol. 1, No. 1, p. 74, pl. 7, fig. 2, 1918 (type locality, Stansbury, St. Vincent Gulf,

South Australia); Waite, The fishes of South Australia, p. 209, fig. 301, 1923 (South Australia).

Histiophryne scortea inconstans McCulloch and Waite, Rec. South Australian Mus., vol. 1, No. 1, p. 75, 1918 (St. Vincent Gulf; Kingscote, Kangaroo Island, South Australia).

This species has a slender short first dorsal spine with a small bulbous tip; first and second dorsal spines with tips free, but enveloped in skin; all rays of soft dorsal, anal, pectoral, and pelvic fins simple; soft dorsal and anal fins membranously attached to caudal peduncle.

Color brownish with a white patch behind second dorsal spine, three other white marks dorsally on side of body.

I have not seen a specimen of this species.

Genus *Echinophryne* McCulloch and Waite

Echinophryne McCulloch and Waite, Rec. Australian Mus., vol. 1, No. 1, p. 66, 1918 (genotype, *Echinophryne crassispina* McCulloch and Waite).

This genus is characterized by having 15 or 16 soft dorsal rays along with the skin covered with denticles, and a distinct caudal peduncle.

Echinophryne crassispina McCulloch and Waite

PLATE 3,A

Echinophryne crassispina McCulloch and Waite, Rec. South Australian Mus., vol. 1, No. 1, p. 67, pl. 6, fig. 2, 1918 (type locality, Spencer Gulf, South Australia); Waite, The fishes of South Australia, p. 210, fig. 302, 1923 (South Australia).

This species is one of only four known antennariids with 15 or 16 soft dorsal rays. It is distinguished from two, *bougainvilli* and *scortea*, by the distinct caudal peduncle and by the stubby first dorsal spine being covered with prickles and ending in a small fleshy process; second and third dorsal spines movable, the third somewhat bound down by skin to body. All fin rays simple except caudal fin rays, which are divided.

I have not seen a specimen of this species.

Echinophryne glauerti Whitley

PLATE 3,B

Echinophryne glauerti Whitley, Australian Zool., vol. 10, pt. 3, 272, 1944 (type locality, Cottesloe Beach, Western Australia); Proc. Roy. Zool. Soc. New South Wales (1944), p. 28, fig. 5, 1944 (Cottesloe).

This species has not been well defined, but it may be recognized by its short simple first dorsal spine, last few rays of soft dorsal divided, along with 16 soft dorsal rays, and all 8 anal rays divided; pectoral 11, all rays simple; caudal peduncle not distinct; background color pale with widely scattered ocellate spots on head and body.

I have not seen a specimen of this species and refer it to this genus with some doubt.

Genus and subgenus *Phrynelox* Whitley

Phrynelox Whitley, Australian Zool., vol. 6, pt. 4, p. 328, 1931 (genotype, *Lophius striatus* Shaw 1794).

This genus is characterized by the bait consisting of bifid or trifid tentacles. The bifid tentacles forming the bait distinguishes the subgenus *Phrynelox* from the subgenus *Triantennatus*, which has three tentacles.

Phrynelox striatus (Shaw)

PLATE 3,C

Lophius striatus Shaw, Naturalists miscellany, vol. 5, p. ?, pl. 175, 1794 (type locality, New Holland); Shaw, General zoology, vol. 5, pt. 2, p. 385, 1804 (Southern Seas).

Antennarius pinnaceps Bleeker (on Commerson), Acta. Soc. Sci. Indo-Neerlandicae, vol. 1, p. 49, 1856; Atlas ichthyologique . . ., vol. 5, p. 15, pl. 197, fig. 5, 1865 (Bali, Amboina); Cuvier and Valenciennes (Histoire naturelle des poissons, vol. 12, p. 410, 1837) use the names "*antennarius*" and "*pinnaceps*" of Commerson as common names). No valid scientific name as listed by Günther (Catalogue of the fishes in the British Museum, vol. 3, p. 190, 1861) occurs in Cuvier and Valenciennes (vol. 12, p. 410, 1837).

Antennarius lacepedei Bleeker, Acta. Soc. Sci. Indo-Neerlandicae, vol. 1, p. 50, 1856 (type locality, Amboina).

Antennarius pinnaceps var. *fasciata* Steindachner, Sitzb. Akad. Wiss. Wien, vol. 53, p. 457 (p. 34 in reprint), 1866 (type locality, Port Jackson, Australia).

Antennarius striatus Smith, The sea fishes of Southern Africa, p. 431, pl. 98, fig. 1240, 1949 (south to Port Alfred).

First dorsal spine much longer than second, bearing bifid tentacles at its tip; second and third dorsal spines movable; last 2 or 3 soft dorsal rays divided; anal rays all divided; pectoral and pelvic rays all simple; caudal peduncle distinct.

I have not examined a specimen of this species. It is distinguished by having bifid tentacles forming the bait along with 10 pectoral fin rays. In color pattern *striatus* resembles *tridens*, but the latter has trifid tentacles forming the bait and 11 pectoral fin rays. Doubt has been cast by authors that the character of the bait is reliable since it is possible that a fish might nip off one or more tentacles. I find no damage to the bait involving complete loss of these tentacles on specimens of related species studied. There are a few specimens in the National Museum collections in which the bait and spine are completely missing, but there is no way of knowing now whether this bait was broken off before preservation or afterward. The damaged base indicates loss of spine during collection or in preservation.

Phrynelox melas (Bleeker)

PLATE 4,A

Antennarius melas Bleeker, Acta Soc. Sci. Indo-Neerlandicae, vol. 2, p. 70, 1857 (type locality, Amboina); Atlas ichthyologique . . ., vol. 1, p. 20, pl. 199, fig. 6, 1865 (Amboina).

?*Antennarius güntheri* Bleeker, Ned. Tijdschr. Dierk., vol. 2, p. 275, 1865 (type locality, Amboina); Atlas ichthyologique . . ., vol. 1, p. 10, pl. 199, fig. 4, 1865 (Amboina).

Antennarius horridus (non Bleeker), Zatzow and Lenz, Abhandl. Senckenb. Naturf. Gesellsch., vol. 21, pt. 3, p. 511, pl. 35, fig. 7, 1898 (Zanzibar).

I have not seen a specimen of this species. It is the species in the Indo-Pacific with blackish coloration along with the bait consisting of bifid tentacles. *Antennarius nuttingi* in the Western Atlantic represents its closest relative.

First dorsal spine longer than second dorsal and bearing bifid tentacles at its tip; last 2 or 3 soft dorsal rays divided, last pelvic ray divided; pectoral rays all simple; anal rays all divided; caudal peduncle distinct.

Antennarius güntheri Bleeker, with bifid tentacles forming the bait, may belong here. The presence of "warts" on the skin may be a pathological condition (see pl. 4,B; also *A. phymatodes*, p. 90). Without specimens I am unable to determine if *A. güntheri* is distinct from *Phrynelox melas*.

Phrynelox nuttingi (Garman)

PLATE 3,D

Antennarius nuttingi Garman, Bull. Lab. Nat. Hist., State University of Iowa, vol. 4, p. 83, pl. 2, 1876 (type locality, Great Bahama Bank); Barbour, Proc. New England Zool. Club, vol. 19, pp. 25, 36, pl. 15, pl. 17, fig. 4, 1942 (Puerto Rico; Bermuda; Haiti; Great Bahama Bank).

This black species, with bifid tentacles (usually whitish) as bait, has a naked area behind base of second dorsal spine, last two or three soft dorsal rays and last pelvic ray divided; pectoral rays all simple; anal rays all divided; caudal peduncle distinct; tips of rays of paired fins usually not white, although in a few specimens there is a tendency for lighter tips to these rays.

While this manuscript was in press Dr. Louis A. Krumholz brought to the National Museum for identification two specimens of *Phrynelox* that he saw spawning together. One, the male, was the characteristically colored *P. scaber*, whereas the other, the female, was the typically black colored *P. nuttingi*. Dr. Krumholz had both males and females with the zebralike color pattern which is typical of *P. scaber*. Three black specimens examined by him were females. His observation

may indicate that the black "species" currently known as *P. nuttingi* represents mature females.

I have observed sexual dichromatism to be of rather common occurrence in several families of reef fishes; for example, the parrotfishes, family Scaridae. This problem needs special study in the field in the areas where the black "color phase" occurs, as it does with several other members of this family.

I have studied 11 specimens. From the U. S. National Museum (number of specimens in parentheses following the museum catalog number): 73115(1), Florida; 50199(1) and 25927(1), both from Puerto Rico. From the Chicago Natural History Museum (CNHM): 1 from off Texas and 6 from Bermuda. Dr. Louis A. Krumholz loaned a female from Bimini.

Phrynelox scaber (Cuvier)

PLATE 4,C,D

Chironectes scaber Cuvier, Mèm. Mus. Hist. Nat. Paris, vol. 3, p. 425, pl. 16, lower fig., 1817 (type locality, Atlantic); Le règne animal, edition of plates, vol. 2, pl. 85, fig. 1, 1839.—Cuvier and Valenciennes, Historie naturelle des poissons, vol. 12, p. 412, 1837 (Martinique).

?*Chironectes furcipilis* Cuvier, Mèm. Mus. Hist. Nat. Paris, vol. 3, p. 429, pl. 17, fig. 1, 1817 (no locality).—Cuvier and Valenciennes, Histoire naturelle des poissons, vol. 12, p. 423, 1837 (Atlantic).

?*Chironectes biocellatus* Cuvier, Mèm. Mus. Hist. Nat. Paris, vol. 3, p. 427, pl. 17, fig. 3, 1817 (no locality).—Cuvier and Valenciennes, Histoire naturelle des poissons, vol. 12, p. 417, 1837.

Chironectes tigris Poey, Memorias sobre la historia natural de la Isla de Cuba, vol. 1, p. 217, pl. 17, fig. 2, 1853 (type locality, Cuba).

Antennarius teleplanus Fowler, Proc. Acad. Nat. Sci. Philadelphia, p. 38, fig. 2, 1912 (type locality, Corson's Inlet, Cape May County, N. J.; type examined).

Antennarius cubensis Borodin, Bull. Vanderbilt Oceanogr. [Marine] Mus., vol. 1, art. 1, p. 24, pl. 3, fig. 1, 1928 (Puerto Padre, Cuba).

Antennarius tenebrosus (non Poey), Barbour, Proc. New England Zool. Club, vol. 19, p. 28, 1942 (Cuba).

Antennarius scaber Barbour, Proc. New England Zool. Club, vol. 19, pp. 26, 36, pl. 8, pl. 17, fig. 1, 1942 (Cuba; St. Lucia; Panamá; Florida, Bermuda; Jamaica).

Antennarius tigris Barbour, Proc. New England Zool. Club, vol. 19, pp. 26, 37, pl. 9, figs. 1, 2, pl. 17, fig. 2, 1942 (Jamaica; Cuba).

Barbour, in 1942, established a neotype (USNM 37545) for *Chironectes tenebrosus* Poey (Memorias sobre la historia natural de la Isla de Cuba, p. 219, pl. 17 (20), fig. 1, 1853) and then referred Poey's *tenebrosus* to the synonymy of *A. multiocellatus* (Cuvier and Valenciennes). Upon examination of USNM 37545, I find the specimen to be a typical example of *Phrynelox scaber*, with all the significant characters such as bait with bifid tentacles, and color pattern of young *scaber*.

This species, with bifid tentacles forming the bait, has a zebralike color pattern. The young, represented by *Antennarius tenebrosus* (non Poey) Barbour on USNM 37545, neotype, is marked with dark spots and blotches not yet formed into zebralike stripes. A naked area or pit occurs behind second dorsal spine; last 2 or 3 soft dorsal rays and last pelvic ray are divided; pectoral rays all simple; anal rays all divided; caudal peduncle distinct; Barbour considers *A. tigris* to be distinct from *A. scaber* on the differences in robustness of the tentacles. I am unable to find support for his observations on the numerous specimens available to me.

In addition to certain types, I have studied 36 specimens. From USNM: Neotype, *Chironectes tenebrosus* Poey, 37545(1), 2699(1), 37500(1), all from Cuba and all collected by Poey; 38531(1), Curaçao; 41709(1), St. Lucia; 30144(1), Jamaica; 81785(1), Porto Bello, Panamá; 81786(1) and 81780(1), both from Fox Bay, Panamá; 126076(1), Puerto Rico; 150053(1), Guadaloupe Island; 116762(2), Tortugas, Florida. From CNHM: 40296(1), 45698(3), 45699(2), 45700(3), 46746(1), 46747(1), 46748(1), and 59956(3), Gulf of Mexico; 17133(1) and 50353(1), Florida; 8549(2), Porto Bello, Panamá; 4852(1), 48511(1), 48541(1), 48603(1), 48604(1), 48633(1), and 48682(1), Bermuda. Dr. Louis A. Krumholz loaned a male from Bimini.

Triantennatus, new subgenus

GENOTYPE: *Antennarius zebrinus*, new species.

This new subgenus is characterized by having three fleshy tentacles at the tip of the first dorsal spine. It has the last 2 or 3 soft dorsal rays and last pelvic ray divided. As in the subgenus *Phrynelox*, all pectoral rays are simple and all anal rays are divided.

The subgenus is named in reference to the first dorsal spine being provided with three fleshy tentacles.

Phrynelox cunninghami (Fowler)

PLATE 5,A.

Antennarius cunninghami Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 93, p. 279, fig. 32, 1941 (type locality, Oahu or Maui, Hawaii; holotype, ANSP 69892, 86 mm. in standard length).

This species has the first dorsal longer than second dorsal spine, and bears at its tip trifid tentacles; last 2 or 3 soft dorsal rays and last pelvic ray divided; all of pectoral rays simple; all of anal rays divided, caudal peduncle distinct.

I have studied the holotype of this species.

Phrynelox zebrinus, new species

FIGURE 3

Antennarius tridens (non Shaw) Bleeker, Atlas ichthyologique . . ., vol. 1, p. 14, pl. 195, fig. 3, 1865 (Amboina).

Antennarius striatus (non Shaw) Günther, Journ. Mus. Godeffroy, pt. 11, p. 162, pl. 99, fig. B, 1876 (Mauritius; Australian Coast; Solomon Islands).

Antennarius pinnaceps (non Shaw) Smith, The sea fishes of Southern Africa, p. 431, pl. 98, fig. 1239, 1949 (Natal and Delagoa Bay).

HOLOTYPE: USNM 47854, Port Jackson, New South Wales, Australia, standard length 96 mm.

PARATYPES: USNM 47853 and 59948, Port Jackson, New South Wales, respectively 89 and 93 mm. in standard length; USNM 28659, probably from Australia; CNHM 21560, Sydney, Australia, 92 mm.; CNHM 44980, Moreton Bay, South Queensland, Australia, 41.5 mm.

DESCRIPTION: Certain counts and measurements are recorded in tables 1 and 2.

The bony part of first dorsal spine, about same length as second dorsal spine, bears at its tip the fleshy bait, which is composed of three fleshy tentacles, the middle one shortest; behind the robust second dorsal spine is a naked dermal area; the third dorsal spine is movable, about same length as the second; all of the soft dorsal rays are simple except the last two which are divided, as is the last pelvic fin ray; caudal fin rays divided or branched; all of anal rays divided; pectoral

FIGURE 3.—*Phrynelox zebrinus*, new species. Drawing by Mrs. A. M. Awl of holotype, USNM 47854, from Port Jackson, New South Wales, Australia.

rays all simple; gill opening close to pectoral fin base; caudal peduncle distinct, a little deeper than long; skin thickly covered with bifid, sometimes trifid, prickles, and a few prickles on head are multifid; dermal cirri are scattered on body apparently in no definite arrangement except possibly along what may be a lateral line.

Color in alcohol: Background coloration light tan; sides and dorsally, including dorsal and anal fins, profusely covered with narrow, zebralike, dark brown streaks; pectoral, pelvic, and caudal fins barred and spotted with dark brown; belly below level of pectoral fin with scattered dark brown spots.

The dark brown, zebralike streaks apparently increase in number with increase in size, because the 41.5 mm. specimen has only 7 or 8 streaks on the dorsal fin and side of body, whereas the larger specimens have 15 or 20 such bars; narrow bars form between the wider ones as growth proceeds. Günther's plate 99, figure B, shows the belly striped, but all of our specimens have it spotted.

Remarks: Among the species with three tentacles forming the bait and with a zebralike color pattern, *A. cunninghami* Fowler is most closely related. The latter differs in the adult size in having a much fewer number of dark brown zebralike markings, only four or five dark bars instead of seven (young) to 20 or more on the soft dorsal fin; also, the belly of *cunninghami* is unspotted in the holotype.

This new species is named *zebrinus* in reference to the color pattern, which resembles that of a zebra.

Phrynelox atra, new species

Figure 4

Antennarius commersonii (non Cuvier; non Shaw) Whitley, Rec. Australian Mus., vol. 17, p. 137, pl. 31, fig. 5, 1929 (Port Jackson and Port Hacking, New South Wales).

Holotype: CNHM 21705, from Sydney, New South Wales, Australia, standard length 73 mm.

Paratypes: CNHM 21704 and USNM 164245, from Sydney, Australia, both 87 mm. in standard length.

Description: Certain counts and measurements are recorded in tables 1 and 2.

The bony part of the first dorsal spine, about the same length as that of the second dorsal spine, bears at its tip the fleshy bait, which consists of three robust tentacles, the middle one smallest; skin just behind base of second dorsal spine is naked; third dorsal spine movable posteriorly, bound down with skin anteriorly, and same length as second; soft dorsal rays all simple except last two are divided; only last pelvic ray divided; caudal fin rays branched; anal rays divided; pectoral rays all simple; gill opening close to base of pectoral fin;

TABLE 2.—*Measurements made on two new species of* Phrynelox (zebrinus *and* atra), *recorded in thousandths of the standard length*

Characters	*zebrinus*						*atra*		
	Port Jackson, New South Wales, Australia			Australia?	Sydney, Australia	Moreton Bay, Queensland, Australia	Sydney, New South Wales, Australia		
	USNM 47853 paratype	USNM 47854 holotype	USNM 59948 paratype	USNM 28659 paratype	CNHM 2156 paratype	CNHM 44980 paratype	CNHM 21704 paratype	CNHM 21705 holotype	CNHM 21707 paratype
Standard length in mm.	89	96	93	82	92	41.5	87	73	87
Greatest depth of body	562	594	613	574	571	518	575	549	575
Length of bony part of 1st dorsal spine	180	174	172	155	163	229	178	199	181
Length of bony part of 2d dorsal spine	146	146	156	146	180	169	184	185	172
Length of bony part of 3d dorsal spine	157	156	151	165	147	188	167	185	207
Longest soft dorsal ray	315	323	258	305	255	337	282	322	299
Longest (middle) caudal ray	337	344	285		327	422	253	343	332
Head (snout to gill opening)	640	604	567	610	635	622	667	644	644
Length of maxillaries	225	229	237		218	233	224	247	207
Least depth of caudal peduncle	146	151	161	140	136	145	121	137	127
Length of caudal peduncle or distance between vertical lines through caudal fin base and rear bases of anal-dorsal fins.	129	99	131	116	120	133	115	123	103
Length of base of soft dorsal fin	438	511	452	445	495	506	473	514	517
Eye diameter	52	42	48	48	59	72	57	52	46
Interorbital space	157	135	154	146	158	147	172	164	155
Dorsal rays	I-I-I-12	I-I-I-12	I-I-I-12	I-I-I-12	I-I-I-12	I-I-I-12	I-I-I-12	I-I-I-12	I-I-I-12
Anal rays	7	7	7	6	7	7	7	7	7
Pectoral rays	10-10	10-10	10-10	10-10	10-11	10-10	10-10	10-10	10-10

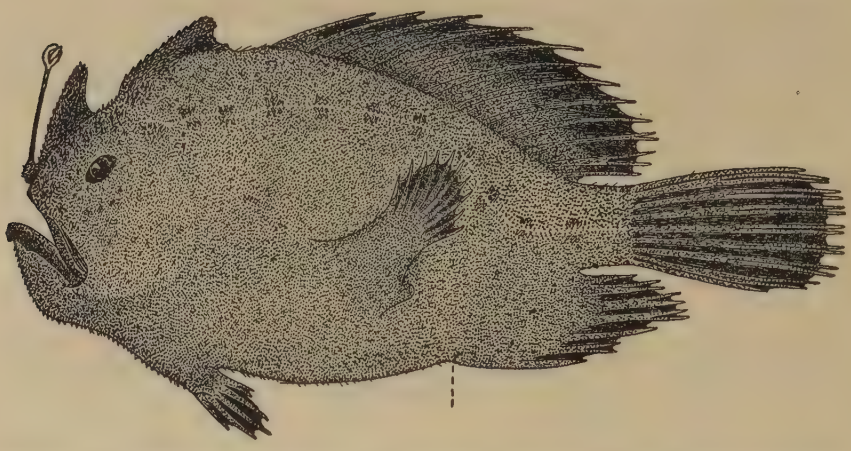

FIGURE 4.—*Phrynelox atra*, new species. Drawing of holotype, CNHM 21705, from Sydney Australia.

caudal peduncle distinct, slightly deeper than long; skin thickly covered with bifid prickles except a few trifid ones and some multifid prickles on head; dermal cirri present along what probably represents a lateral line, though it is not easy to follow, other cirri scattered on body.

COLOR IN ALCOHOL: Head, body, and fins all plain black; fleshy part of bait white or nearly so; tips of rays of pectoral and pelvics a little lighter than basally, sometimes almost whitish.

REMARKS: This new species, almost entirely blackish, resembles *Phrynelox nox* of Japan. It differs by having 10 pectoral fin rays instead of 11, and, in addition, the tips of the pectoral fin rays are scarcely lighter than basally. *P. nox* may have black spots on median and paired fins, usually distally, absent in *P. atra*. The bait is light brown in *P. nox* also.

This new species is named *atra* in reference to its black coloration.

Phrynelox nox (Jordan)

FIGURE 5

Antennarius nox Jordan, *in* Jordan and Sindo, Proc. U. S. Nat. Mus., vol. 24, p. 375, fig. 6, 1902 (type locality, Wakanoura and Nagasaki, Japan; cotype, USNM 49819).—Jordan, Tanaka, and Snyder, Journ. Coll. Sci., Tokyo Imp. Univ., vol. 33, art. 1, p. 424, fig. 392, 1913 (Japan).—Jordan and Thompson, Mem. Carnegie Mus., vol. 6, p. 313, fig. 87, 1914 (Misaki, Japan).

Antennarius tridens (non Temminck and Schlegel; in part) Tanaka, Figures and descriptions of the fishes of Japan, vol. 47, p. 929, pl. 186, figs. 509, 510, 1930 (Japan).

Antennarius fuliginosus J. L. B. Smith, South African Journ. Sci., vol. 53, No. 8, p. 222, fig. 5, 1957 (type locality, Durban, South Africa).

This species is characterized by its dark brownish to blackish coloration, along with trifid fleshy tentacles at tip of first dorsal spine; last 2 or 3 soft dorsal rays and last pelvic ray divided; anal rays all divided, pectoral rays all simple; caudal peduncle distinct; naked area behind second dorsal spine; black spots as large as or larger than the eye usually evident on head and body; tips of pectoral rays white; black spots may occur distally on all fins; first dorsal spine may be barred.

I have studied three specimens, all from Japan: From USNM: 49819(1) (the cotype) and 164192(1). From CNHM: 57440(1).

Phrynelox tridens (Temminck and Schlegel)

PLATE 5,B

Lophius histrio (non Linnaeus) Lacepède, Histoire naturelle des poissons, vol. 1, pp. 302, 321, 1798 (on Commerson; nonbinomial).

Chironectes tridens, Temminck and Schlegel, Fauna Japonica, poissons, p. 159, pl. 81, figs. 2–5, 1842 (type locality, Japan).

Antennarius pinniceps bleekeri Günther, Catalogue of the fishes in the British Museum, vol. 3, p. 190, 1861 (type locality, Amboina).

This species, with trifid tentacles forming the bait, has a characteristic pale background overlaid with zebralike dark brown or blackish streaks on the body and blackish spots on the median fins; the belly has dark brown spots also; there is a naked area behind the second dorsal spine, the last 2 or 3 rays of soft dorsal are branched, as is the last pelvic ray; anal rays all divided; pectoral rays all simple; caudal peduncle distinct; the color pattern of *tridens* is almost identical with

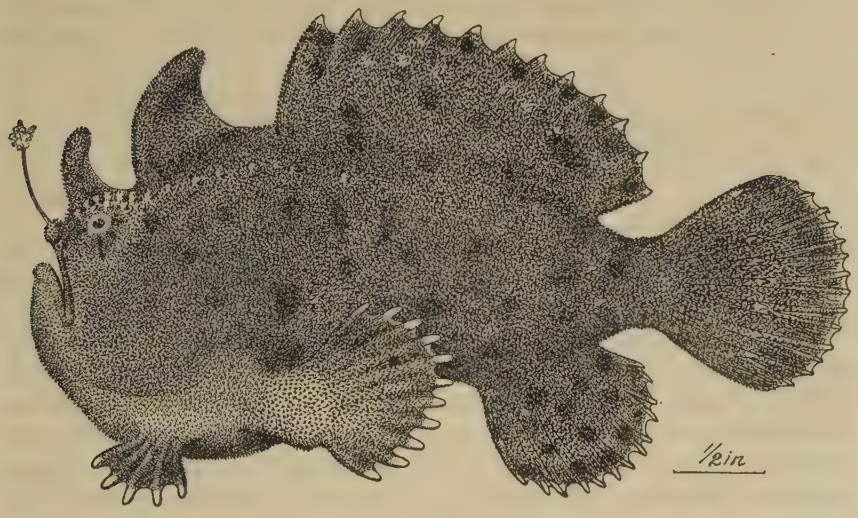

FIGURE 5.—*Phrynelox nox* (Jordan) *in* Jordan and Sindo. Drawing of cotype, USNM 49819 from Japan.

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cunninghami but the two differ in number of pectoral rays—11 in *tridens* and 10 in *cunninghami*.

I have studied 35 specimens. From USNM: 49821(5), 50759(1), 57525(1), 59770(1), 59771(3), 72017(1), 72030(2), 75974(1), 76261(9), and 152540(1), all from Japan; 143564(4), Mauritius (locality very doubtful). From CNHM (loaned by Loren P. Woods): 55397(2), 55461(1), 58850(1), 57441(2), all from Japan.

Antennatus, new genus and new subgenus

GENOTYPE: *Antennarius strigatus* Gill.

The new genus and new subgenus are distinguished by the simple tentacle at tip of first dorsal spine in combination with the following characters: the head, body, and fins basally thickly covered with close-set prickles on firm skin; no distinct caudal peduncle; the third dorsal spine bound down with skin; and all the rays in soft dorsal and pelvic fins simple.

Antennatus bigibbus (Lacepède)

PLATE 5,C,D

Antennarius bigibbus Lacepède, Histoire naturelle des poissons, vol. 1, p. 325, pl. 14 upper fig., 1798 (type locality, "on Commerson").—Bleeker, Atlas ichthyologique, vol. 5, p. 21, pl. 199, fig. 3, 1865 (Cocos; Amboina).—Günther, Journ. Mus. Godeffroy, pt. 11, p. 165, 1876; pt. 13, pl. 105, fig. B, 1877 (Huahine).—Smith, The sea fishes of Southern Africa, p. 430, pl. 98, fig. 1235, 1949 (Natal).

?*Antennarius bivertex* Lacepède, Histoire naturelle des poissons, vol. 1, p. 327, 1798 (on Commerson).

Chironectes tuberosus Cuvier, Mem. Mus. Hist. Nat. Paris, vol. 3, p. 432, 1817 (on Commerson; Mauritius).—Cuvier and Valenciennes, Histoire naturelle des poissons, vol. 12, p. 428, 1837 (Mauritius).

Chironectes reticulatus Eydoux and Souleyet, Voyage autour du Monde . . . *La Bonite*, Zool., vol. 1, pt. 2, Poissons, p. 186, pl. 5, fig. 2, 1842 (type locality, Hawaiian Islands).

Chironectes leprosus Eydoux and Souleyet, Voyage autour du Monde . . . *La Bonite*, Zool. vol. 1, pt. 2, Poissons, p. 187, pl. 5, fig. 3, 1842 (type locality, Hawaiian Islands).

?*Chironectes subrotundatus* Castelnau, Philadelphia International Exhibition 1876; Intercolonial Exhibition Essays, No. 2, p. 25, 1876 (type locality, Port Walcott, Western Australia).

This species has a simple threadlike first dorsal spine and bait, the latter scarcely distinguishable from the spiny part; the body, head, and fins basally are thickly covered with close-set prickles so that the skin is firm; no naked area occurs behind the second dorsal spine; third dorsal spine bound down with skin, thus it is immovable; none of the soft dorsal or pelvic rays are branched; anal rays all branched; pectoral rays all simple; caudal peduncle absent or nearly so; background color pale, mottled or reticulated with brown; brown bar across

caudal, anal, and pelvic fins; pectoral brownish basally, sometimes with a series of brown spots distally.

I have studied nine specimens. From USNM: 65732(1), Fakarava, Tuamotu Islands; 109396(1), Palmyra Island; 126598(1), Honolulu; 164206(2), New Georgia Island, Solomons; 167511(1), Oahu. From CNHM: 47648(1), Hawaii. Loaned by Dr. R. R. Harry (2): Tuamotu Islands in the channel between Geogeo and Kukina islets near Garumaoa village (collected by Dr. Harry in 1952).

Antennatus strigatus (Gill)

PLATE 6,c

Antennarius strigatus Gill, Proc. Acad. Nat. Sci. Philadelphia, p. 92, 1863 (type locality, Cape San Lucas; 2 types, USNM 6267).

Antennarius tenuifilis Günther, Trans. Zool. Soc. London, vol. 6, pt. 7, p. 440, 1869 (type locality, reefs off Panama City, Panamá).

Antennarius reticularis Gilbert, Proc. U. S. Nat. Mus., vol. 14, p. 566, 1892 (type locality, Gulf of California; holotype, USNM 48260).

Antennarius ziesenhennei Myers and Wade, Allan Hancock Pacific Exped., vol. 9, No. 6, p. 168, pl. 23, fig. 7, 1946 (type locality, James Island, Galápagos).

This species is the eastern Pacific representative of *A. bigibbus*, but differs mostly in the number of pectoral fin rays being 9 or 10 instead of 11; body, head, and fins basally covered by shagreenlike, closely packed denticles; the simple first dorsal spine and bait is about as long as second dorsal spine, whereas in *bigibbus* it is longer; all soft dorsal, pectoral, and pelvic rays undivided; anal rays all divided; no naked area behind second dorsal spine; third dorsal spine bound down with skin, immovable; body mottled with blackish or dark brown, the blackish extending on the fins; a dark bar across caudal, anal, pelvic, and pectoral fins; membranes between rays distally edged with blackish; underside of head with dark blotches.

In addition to the types, I have studied 4 specimens. From USNM: 120208(1), Galápagos Islands; 101756(2), Gorgona Island, Colombia; 101757(1), Secas Island, Panamá.

Xenophrynichthys, new subgenus

GENOTYPE: *Antennarius cryptacanthus* Weber.

This new subgenus differs in having the three dorsal spines completely embedded and covered over with skin, whereas the generalized antennariids have the first two dorsal spines free and the third covered with skin in only a few species, otherwise it is more or less movable, sometimes free.

Named in reference to the unusual or strange embedded nature of the dorsal spines of this otherwise normal frogfish.

Antennatus cryptacanthus (Weber)

PLATE 6,B

Antennarius cryptacanthus Weber, Die Fische der *Siboga*-Expedition, p. 564; pl. 3, fig. 2, 1913 (type locality, Beo, Karakelang Island, and Pepela Bay, Rotti Island, East Indies).

The usual three dorsal spines are completely embedded beneath the rough skin in this species, a character not shared with any other species in the family. I have not seen this species. It is known only from the two type specimens.

Genus and subgenus *Lophiocharon* Whitley

Lophiocharon Whitley, Rec. Australian Mus., vol. 19, p. 104, pl. 15, fig. 1, 1933 (genotype, *Lophiocharon broomensis* Whitley=*Chironectes trisignatus* Richardson).

This genus and subgenus are characterized by having a simple tentacle at tip of first dorsal spine in combination with an indistinct caudal peduncle; all of the soft dorsal rays being branched or divided but no pelvic ray branched.

Lophiocharon caudimaculatus (Rüppell)

PLATE 6,A,D

Chironectes caudimaculatus Rüppell, Neue Wirbelthiere zu der Fauna von Abyssinien . . . , p. 141, pl. 33, fig. 2, 1835 (type locality, Red Sea).

Chironectes trisignatus Richardson, Ichthyology of the voyage . . . *Erebus* and *Terror*, pl. 9, fig. 1, 1844–1848 (no locality given).

Antennarius urophthalmus Bleeker, Natuurk. Tijdschr. Nederlandsch-Indië, vol. 2, p. 488, 1851 (type locality, Riouw).

Antennarius lindgreeni Bleeker, Natuurk. Tijdschr. Nederlandsch-Indië, vol. 8, p. 192, 1855 (type locality, Banka).

Antennarius caudimaculatus Bleeker, Atlas ichthyologique, vol. 1, p. 15, pl. 197, fig. 6, 1865 (Banka; Biliton; Bintang; Singapura).

Antennarius lithinostomus Jordan and Richardson, Bull. U. S. Bur. Fish., vol. 27, p. 286, fig. 12, 1908 (type locality, Cugo Island, Philippines).

Lophiocharon broomensis Whitley, Rec. Australian Mus., vol. 19, No. 1, p. 104, pl. 25, fig. 1, 1933 (type locality, Broome, West Australia).

This is one of the few species of antennariids with all the soft dorsal rays divided; the first dorsal spine is very long and threadlike with a simple tentacular-like bait; no naked area behind second dorsal spine; third dorsal spine movable; none of the pelvic or pectoral rays divided; all anal rays divided; caudal peduncle not distinct; the coloration is light gray, everywhere thickly covered with dark specks and irregularly shaped small dark blotches; caudal fin dark spots with white centers.

All specimens seen by me are like the one illustrated, USNM 164243. These have an indistinct caudal peduncle, the caudal fin

has white centered dark spots, and a dark blotch basally in soft dorsal fin. These specimens are like the figure of *Chironectes trisignatus* Richardson. Ruppell's plate 33, figure 2, of *C. caudimaculatus* is either in error in regard to the distinct caudal peduncle along with that of Bleeker's plate 197, figure 6, or two species are involved. It is possible that *horridus*, with a distinct caudal peduncle, was confused with *caudimaculatus* by authors.

I have studied six specimens. From USNM: 164243(1), Sandakan District, North Borneo; 164360, the Philippines. From CNHM (loaned by Loren P. Woods): 51865(1), 51866(2), 51874(1), all from Sandakan District, North Borneo.

Uniantennatus, new subgenus

GENOTYPE: *Antennarius horridus* Bleeker.

This new subgenus is characterized by having a simple tentacle at tip of first dorsal spine in combination with a distinct caudal peduncle, and with only the last two or three soft dorsal rays branched or divided.

Named in reference to the tip of first dorsal spine being provided with a simple tentacle.

Lophiocharon tenebrosus (Poey)

PLATES 7,A, 14,B

Chironectes tenebrosus Poey, Memórias sobre la historia natural de la isla de Cuba, p. 219, pl. 17, fig. 1, 1853 (type locality, Cuba).

Herewith is a redescription of this species based on a specimen kindly given to the National Museum by Dr. C. Richard Robins. The following counts were made: Dorsal I–I–I, 12; anal 7; pectoral 10–10; pelvics 5–5 (last ray divided); caudal 4+5.

The following characters are recorded in thousandths of the standard length, 78 mm. Greatest depth 635; length of bony part of first dorsal spine 269; of second dorsal spine 105, of third 231; longest soft dorsal ray 231; longest (middle) caudal ray 295; length of head (tip of snout to gill opening) 638; length of maxillaries 263; least depth of caudal peduncle 155; length of caudal peduncle (distance between vertical lines thru caudal fin base and rear of membranous base of anal and dorsal fins) 68; length of base of soft dorsal 481; eye diameter 73; interorbital space 106.

The bony part of first dorsal spine is 2½ times length of second dorsal spine; no filaments occur at tip of first dorsal spine, which is simple, slender, hairlike; second dorsal spine short, curved; third dorsal spine longer than second, curved, movable, but bound to body with skin; area behind base of second dorsal spine, partly naked; all soft rays of dorsal simple except last 2 are divided; anal and caudal

rays all divided; pectoral rays all simple; last pelvic ray divided; others simple; caudal peduncle present; body, head, and fins finely denticulate; skin firm.

Color in alcohol: Background light brown, mottled with yellow (bright yellow when alive); scattered ocellate black spots on body and median fins; small ocellate spots on pectoral fin; pelvics plain white; caudal peduncle yellow; tips of pectoral, caudal, soft dorsal and anal fins white; soft dorsal and anal with a broad yellow band submarginally

Dr. C. Richard Robins, University of Miami, Florida, kindly sent this specimen to me for identification and gave permission for its inclusion in this review. It was assigned USNM 174940 and has the following data: Miami, Key Biscayne, ocean side, north of lighthouse, Oct. 15, 1956, collector Durbin Tabb, standard length 78 mm., total length 100 mm.

Barbour (Proc. New England Zool. Club, vol. 19, p. 28, 1942) designated USNM 37545 as the neotype of *Chironectes tenebrosus* Poey and then referred it to the synonymy of *A. multiocellatus* (Cuvier and Valenciennes). Both of these actions were in error zoologically. USNM 37545 is a typically young specimen of *A. scaber* (Cuvier).

Furthermore, Barbour's action was unsound nomenclatorially because neotypes were without official standing until the "Copenhagen decisions on Zoological Nomenclature," 1953. Since Barbour's designation of the neotype does not fulfill the provisions established for neotypes, I herewith reject it.

Poey's figure shows first dorsal spine longer than second; all fin rays are illustrated as simple except in caudal fin and probably last pelvic ray; caudal peduncle distinct. Doubt must be cast on the accuracy of soft dorsal and of anal rays in regard to the details of branched or not.

Lophiocharon horridus (Bleeker)

PLATE 7,B

Antennarius horridus Bleeker, Natuurk. Tijdschr. Nederlandsch-Indië, vol. 5, p. 83, 1853 (type locality, Solor); Atlas ichthyologique, vol. 5, pl. 194, fig. 1, 1865 (Cocos; Celebes; Flores; Solor; Timor; Buro; Amboina; and Ceram).

?*Antennarius lutescens* Seale, Occ. Pap. Bishop Mus., vol. 4, p. 89, fig. 2, No. 1347 on p. 14, 1906 (type locality, Tahiti).

Antennarius lateralis Tanaka, Zool. Mag., vol. 29, No. 345, p. 200, 1917 (type locality, Tanabe, Province Kii, Japan); Figures and descriptions of the fishes of Japan, vols. 27, 28, p. 494, pl. 135, fig. 378, 1918. (Tanabe, Japan).

Lophiocharon goramensis (non Bleeker) Whitley, Australian Zool., vol. 10, pt. 1, p. 45, pl. 2, fig. 29, 1941 (off Cairns, North Queensland, Australia).

Antennarius commersoni Smith, The sea fishes of southern Africa, p. 430, pl. 98, fig. 1236, 1949 (Natal).

This species has the first dorsal spine long and slender with a simple tentacle forming the bait; last two or three soft dorsal rays and

the last pelvic ray divided; pectoral rays all simple; anal rays all divided; caudal peduncle distinct; naked area behind second dorsal spine; general coloration dark brown, spotted or speckled with blackish, and some ocellate spots present; Tanaka shows the distal edges of median fins pale. The above characters along with 12 or 13 soft dorsal rays, 8 or 9 anal rays, and 10 to 12 pectoral rays should aid in recognizing this species.

The only specimen that I have seen that could be assigned to *horridus* is USNM 19991, probably from Mauritius, but the bait is missing and the specimen is in imperfect condition. It has the following counts: dorsal soft rays 12, anal 8, and pectoral 11–11.

Lophiocharon campylacanthus (Bleeker)

PLATE 7,C

Antennarius campylacanthus Bleeker, Nat. Verh. Hollandaise Maatsch. Wetensch. Haarlem, vol. 18, No. 2, p. 28, pl. 4, fig. 3, 1863 (type locality, Ashantee, Guinea, West Africa).

I have not seen a specimen of this species. Bleeker's figure shows the last three soft dorsal rays divided, none of the pelvic or pectoral rays divided; anal rays all divided; caudal peduncle distinct; no naked area behind second dorsal spine; the dark colored body has three large ocellate spots on the side, and each median fin with a few large ocellate spots. The very short, simple first dorsal spine shorter than the second dorsal spine is an important character.

Genus *Antennarius* Lacepède

Antennarius (Commerson MS.) Lacepède, Histoire naturelle des poissons, vol. 1, p. 325, 1798 (genotype: *Antennarius chironectes* (Commerson) Lacepède (= *Lophius commersoni* Shaw 1804 and authors), designated by Bleeker (Atlas ichthyologique, vol. 1, p. 5, 1865)).

Chironectes Cuvier, Mem. Mus. Hist. Nat. Paris, vol. 3, p. 418, 1817 (genotype, *Lophius chironectes* (Commerson) Lacepède).

Batrachopus Goldfuss, Handbuch der Zoologie, vol. 2, pt. 3, p. 110, 1820. (Proposed to replace *Chironectes* Cuvier 1817, no species listed, *Histrio* Linnaeus is listed) [Obviously author is confused.]

Capellaria Gistel, Naturgeschichte des Thierreichs, p. viii, 1848. (Subs. name for *Chironectes*, no species listed.)

This genus is characterized by having a complex bait consisting of a tuft of tentacles or a bulbous bait with or without obvious tentacles, all anal rays branched, in combination with the last two or three soft dorsal rays divided or none of dorsal rays divided; the caudal peduncle is distinct or indistinct.

Among the numerous species assigned to this genus, certain groups of species indicate divergent lines of evolution.

Subgenus *Fowlerichthys* Barbour

Fowlerichthys Barbour, Proc. New England Zool. Club, vol. 19, p. 12, pl. 7, 1941 (genotype, *Fowlerichthys floridanus* Barbour=*Antennarius radiosus* Garman).

This subgenus is characterized by having a tuft of tentacles or a bulbouslike bait with filaments in combination with a distinct caudal peduncle, all soft rays, except possibly first two or three, of dorsal are divided; pelvic rays all divided.

Fowlerichthys floridanus Barbour (Proc. New England Zool. Club, vol. 19, p. 12, 1941) presents a difficult problem as regards the genus and species to which the type is related. Although the late Dr. Barbour thought the holotype was close to the genus *Chaunax*, I disagree because: (1) The dermal denticles are like those in *Antennarius;* (2) since the type is badly eroded, that which remains resembles other eroded specimens of *Antennarius* that I have examined, leaving exposed dorsal spines, no bait, and only stubs for most of the fin rays; (3) the generic allocation in the family Antennariidae is difficult because of the incomplete condition of the type. However, those characters remaining do help in forming an opinion as follows: (a) the bait is missing, but the presence of the little bony knob from which it always arises is present, indicating that the bait was lost through erosion, probably in the dredge in which collected; (b) the caudal peduncle is distinct, as the last rays of dorsal and anal fins are far in front of caudal fin base; (c) the dorsal spines project because the skin that covered them has eroded away; and (d) the first three pelvic rays are said to be branched, but in all other species of this family if the first three pelvic rays were branched all pelvic rays were branched.

The above characters, along with general shape of body indicates without doubt that *F. floridanus* belongs to the genus *Antennarius*. Among all Atlantic species in the family Antennariidae, only three—*Antennarius radiosus*, *A. ocellatus*, and *Kanazawaichthys scutatus*, new species—have 13 pectoral fin rays. Since bony scutes are absent on the head of *F. floridanus* it is not close to *K. scutatus*. Since *A. ocellatus* usually has 12 pectoral, 8 anal, and 13 soft dorsal rays, it is improbable that *floridanus* is the same as *ocellatus*.

If the pelvic rays of *F. floridanus* are all branched, as I suspect they are, then it would belong to the same subgenus with *radiosus*, and is no doubt a synonym of that species.

Doubt must be cast on the depth of capture of 400 to 500 fathoms since the fish might have gotten in the dredge when it was being hauled to the surface.

Antennarius radiosus Garman

PLATE 7,D

Antennarius radiosus Garman, Bull. Lab. Nat. Hist. State Univ. Iowa, vol. 4, No. 1, p. 85, pl. 1, 1876 (type locality, Key West, Fla., and Havana, Cuba).—Barbour, Proc. New England Zool. Club, vol. 19, pp. 31, 38, pl. 16, fig. 1, pl. 17, fig. 3, 1942 (Florida; Bermuda).

Fowlerichthys floridanus Barbour, Proc. New England Zool. Club, vol. 19, p. 12, pl. 7, 1941 (type locality, off Palm Beach, Fla.).

This is one of the most frequently captured species of *Antennarius* in the vicinity of Florida and along the northern part of the Gulf of Mexico. *A. radiosus* is best characterized by the first dorsal spine being a little longer than the second and bearing at its tip a small compact bulbous bait with short filaments; along with 8 anal rays and usually 13, sometimes 14, pectoral rays; all the soft dorsal, anal, and pelvic rays are divided; pectoral rays all simple; a naked area occurs behind second dorsal spine; caudal peduncle distinct; third dorsal spine movable; coloration generally brown or grayish, somewhat mottled; median fins barred; a characteristic ocellate spot occurs near bases of soft dorsal rays 8 to 10, a little more on body than on base of fin.

I have studied 103 specimens from USNM: 30210(1), Pensacola, Fla.; 134251(1), off Pensacola, Fla.; 116761(15), Tortugas, Fla.; 129814(1) and 131615(2), Key West, Fla.; 142894(9) and 148521(4), near Apalachiola, Fla.; 152222(1), 153142(1), 153143(1), 153144(3), 153145(4), 153225(3), and 161369(1), Palm Beach, Fla.; 131644(1), 143163(2), 120195(1), Gulf of Mexico; 153141(1), Sombrero Light, Fla.; 101585(1), 101586(1), and 101509(2), off Florida; 123505(1), 133649(7), 155479(2), 155481(2), 155483(2), 155486(1), 155487(4), 155488(3), 163984(4), 163985(4), and 162594(1), off Louisiana; 151925(1) off Salvo, N. C.; 155480(1), 155484(1), 155485(5), and 163986(2), off Mississippi; 155482(1), 155489(1), 155490(2), and 155491(2), off Texas; 155492(1) and 155493(1) off Savannah, Ga. In addition I have studied numerous specimens in 25 lots from the Gulf of Mexico loaned by the Chicago Natural History Museum.

Antennarius avalonis Jordan and Starks

FIGURE 6

Antennarius avalonis Jordan and Starks, Proc. U. S. Nat. Mus., vol. 32, p. 76, 1907 (type locality, Avalon Bay, Santa Catalina Island, Calif.).

Antennarius sanguineus (non Gill) Meek and Hildebrand, Field Mus. Nat. Hist. Pub. No. 249, Zool. Ser., vol. 15, pt. 3, p. 1013, 1928 (Panamá)—Hildebrand, U. S. Nat. Mus. Bull. 189, p. 501, 1946 (San Lorenzo Island, Perú).

This species is characterized by the first dorsal spine being shorter than the second, the bait in the form of a filamentous bulb; soft dorsal, anal, and pelvic rays all divided; most or all of pectoral rays

FIGURE 6.—*Antennarius avalonis* Jordan and Starks. Drawing of type retouched by author.

divided (in small to half grown specimens the divided rays may need the skin removed on one side before the branched condition of the ray can be seen); naked area behind second dorsal spine; third dorsal spine movable; caudal peduncle distinct. Coloration of brownish reticulations and dark brown spots on fins and body, a distinct ocellate spot on soft dorsal at bases of rays 9 to 11.

This species has been generally misidentified as *sanguineus* (for example, all specimens recorded below from Panamá by Meek and Hildebrand, "The Marine Fishes of Panama"). I have studied 23 specimens. From USNM: 82694(1), 81779(3), and 81787(1), all from Panamá; 144727(2) and 144726(11) from Guaymus, México; 128237(1), San Lorenzo Island, Perú. From CNHM: 8547(3) and 8548(1) from Panamá.

Antennarius sarasa Tanaka

PLATE 8,A

Antennarius sarasa Tanaka, Zool. Mag., vol. 28, No. 330, p. 143, 1916 (type locality, Tokyo Market); Figures and descriptions of the fishes of Japan, vol. 25, p. 432, pl. 119, fig. 346, 1916 (Tokyo Market).

This species, with first dorsal spine shorter than second, may have all the soft dorsal and anal rays divided, but Tanaka's drawing shows only the last eight dorsal rays divided; probably all of the pelvic rays are divided; third dorsal spine movable; caudal peduncle distinct.

This species is known from Tanaka's description and figure. I have not seen a specimen.

Antennarius ocellatus (Bloch and Schneider)

PLATE 8,B

Lophius histrio var. *ocellatus* Bloch and Schneider, Systema ichthyologiae, p. 142, 1801, on Parra, pl. 1, 1787).

Chironectes ocellatus Cuvier and Valenciennes, Histoire naturelle des poissons, vol. 12, p. 419, 1837 (Cuba).

Antennarius pleurophthalmus Gill, Proc. Acad. Nat. Sci. Philadelphia, p. 92, 1863 (type locality, Charlotte Harbor, Fla., not Key West; holotype, USNM 5886).

Antennarius astroscopus (non Nichols) Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 92, pp. 19, 21, fig. 37, 1940 (Boca Grande, Fla).

Antennarius ocellatus Barbour, Proc. New England Zool. Club, vol. 19, pp. 30, 38, pl. 12, pl. 17, fig. 6, 1942 (Florida; Puerto Rico; Louisiana; Mississippi; Yucatan; South Carolina).

This species has the first dorsal spine a little shorter than the second dorsal spine; the third dorsal spine movable; bait consists of a filamentous bulb; area behind second dorsal naked except in large adults, about 140 mm. and longer; all the anal, soft dorsal, pelvic, and pectoral rays are divided; caudal peduncle distinct; background color light brown to brown, darker dorsally, overlaid with somewhat scattered dark brown dots or small spots; a large ocellate spot occurs basally on dorsal soft rays 7 to 9 and one on lower side of body over anal fin origin; another may or may not occur on middle of caudal fin.

I have studied 17 specimens. From USNM: 4545(1) and 4546(1), unknown localities; 5886(1) (holotype of *A. pleurophthalmus* Gill); 73114(1), Puerto Rico; 143181(1), 33001(1), 125386(1), 119310(1), 124280(2), 153234(2), 155478(1), all from both coasts of Florida; 155477(1) off Wilmington, N. C.; 163947(1) Spanish Wells, Bahamas. From CNHM: 45696(1), 59957(1), and 59958(1), all from Gulf of Mexico.

Plumantennatus, new subgenus

GENOTYPE: *Antennarius asper* Macleay.

This subgenus is characterized by having a plumelike bait, caudal peduncle absent, and all the soft dorsal rays divided but all the pelvic rays simple.

Antennarius asper Macleay

PLATE 8,C

Chironectes caudimaculatus (non Rüppell) Richardson, Ichthyology of the voyage . . . *Erebus* and *Terror*, p. 125, pl. 60, figs. 8, 9, 1844–1848 (Australia).

Antennarius asper Macleay, Proc. Linn. Soc. New South Wales, vol. 5, p. 580, 1881 (type locality, Darnley Island, Australia).—Whitley, Australian Zool., vol. 10, pt. 1, p. 46, pl. 2, fig. 30, 1941 (Murray Island).

This species has the first dorsal spine longer than the second, the bait consists of a broad ribbonlike tentacle with filaments basally, and

some distally; all of the soft dorsal and anal rays are divided but no pelvic or pectoral rays divided; no naked area behind base of second dorsal spine; caudal peduncle absent; coloration consists of a pale background, but profusely covered with small blackish spots or oblong small blotches, even on all fins; the caudal fin has three cross rows of hyaline spots encircled with a blackish line; at base of soft dorsal rays 7 to 9 is an ocellate spot with an unusually wide white area; distally the dorsal fin is broadly white-edged.

I have studied two specimens: USNM 164194 from Woods Inlet, West of Darwin, collected by Robert R. Miller, and CNHM 47248, from Singapore. The latter specimen is black all over, except distal edges of all median fins and tips of rays of paired fins are pale.

Subgenus *Antennarius* Lacepède

This subgenus is characterized by having only the last two or three soft dorsal rays divided; none or only the last pelvic ray divided; pectoral rays all simple; anal rays all divided, except possibly first is simple.

Antennarius phymatodes Bleeker

PLATE 11,A

Antennarius phymatodes Bleeker, Acta Soc. Sci. Indo-Neerlandicae, vol. 3, p. 69, 1857 (type locality, Amboina); Atlas ichthyologique, vol. 5, p. 11, pls. 197, fig. 1, and pl. 199, fig. 5, 1865 (Amboina).

This species was distinguished by Bleeker on the basis of "warts" on the skin. His figure does not show any of the rays branched except those of the caudal fin. This, in my opinion, would place *phymatodes* as a distinct species.

Dr. Robert R. Harry kindly loaned his Ifaluk Atoll collection of antennariids, and one specimen, 26.5 mm. in standard length with "warts" on the skin, agrees with *phymatodes* in not having any fin rays branched except those of the caudal. The color pattern has almost faded in the Ifaluk specimen and differs from *phymatodes* by lacking black spots. This might be caused by its small size, and until more material is available it is not good ichthyology to describe his specimen as new.

Antennarius hispidus (Bloch and Schneider)

PLATE 8,D

Lophius hispidus Bloch and Schneider, Systema ichthyologiae, p. 142, 1801 (type locality, Indian Ocean).

Chironectes lophotes Cuvier, Mem, Mus. Hist. Nat. Paris, vol. 3, p. 428, pl. 17, fig. 2, 1817 (no locality).

Chironectes hispidus Cuvier and Valenciennes, Histoire naturelle des poissons, vol. 12, p. 407, 1837 (East Indies).

Antennarius hispidus Bleeker, Atlas ichthyologique, vol. 5, p. 14, pl. 194, fig. 2, pl. 197, fig. 1, 1865 (Singapura; Ceram, Amboina).—Günther, Journ. Mus. Godeffroy, pt. 11, p. 162, pl. 99, fig. A, 1876 (Misol).

Antennarius scriptissimus Jordan, *in* Jordan and Sindo, Proc. U. S. Nat. Mus., vol. 24, p. 373, fig. 4, 1902 (type locality, Boshu, Tokyo Bay, Japan).

Antennarius tridens (non Temminck and Schlegel, in part) Tanaka, Figures and descriptions of the fishes of Japan, vol. 47, p. 929, pl. 186, fig. 508, 1930 (Japan).

Antennarius hispidus, Smith, The sea fishes of southern Africa, p. 430, p. 98, fig. 1234, 1949 (South to Knysna).

This species, with the first dorsal spine about the same length as the second dorsal spine, has for the bait a large tuft of filaments; second dorsal spine movable; only the last two, possibly last three, soft dorsal rays are divided; last pelvic ray divided; all anal rays divided; pectoral rays all simple; caudal peduncle distinct; naked area behind second dorsal spine; background coloration pale or light tan, overlaid with zebralike brown streaks, the pale interspaces 2 to 4 or more times wider than the narrow brown streaks; all fins with dark brown or blackish spots.

I have studied four specimens, all from the Philippines. From USNM: 56284(1), 56314(1), and 164361(1). From CNHM: 47095(1).

Antennarius moluccensis Bleeker

PLATE 9,A,C

Chironectes commersoni (non Shaw 1804) Cuvier, Mem. Mus. Hist. Nat. Paris, vol. 3, p. 431, pl. 18, fig. 1, 1817 (type locality, Sea of the Indies); Cuvier and Valenciennes, Histoire naturelle des poissons, vol. 12, p. 426, 1837 (on Cuvier, 1817).

Antennarius moluccensis Bleeker, Natuurk. Tijdschr. Nederlandsch-Indië, vol. 8, p. 414, 1855 (type locality, Amboina); Atlas ichthyologique, vol. 5, p. 17, pl. 196, fig. 2, 1865 (Amboina; Celebes).

Antennarius goramensis Bleeker, Nederlandsch Tijdschr. Dierk., vol. 2, p. 177, 1865 (type locality, Goram); Atlas ichthyologique, vol. 1, p. 17, pl. 195, fig. 2, 1865 (Goram).

Dr. de Beaufort has examined the types of *commersoni* Cuvier 1817, *moluccensis* Bleeker 1855, and *goramensis* Bleeker 1865 and finds them to represent the same species.

This species is known from large specimens only; has a long slender first dorsal spine, with a slender filamentous tentacle, no naked area behind second dorsal spine, third dorsal spine movable; last two rays of soft dorsal and last pelvic ray divided; anal rays all divided; pectoral rays all simple; caudal peduncle distinct but the anal fin is membranously attached to peduncle notably much farther back than that of dorsal fin; coloration light brown or reddish brown, everywhere spotted or blotched with brown; ocellate spots occur at middle of length of base of anal fin, at bases of soft dorsal rays 7 to 9, and an

ocellate spot on midside of body; these spots have broken up to form a block of smaller spots on the 215 mm. specimen.

I refer to this species with some doubt, two specimens, USNM 32507 from ?"California," 80 mm. in standard length, 108 mm. total length, and USNM 81061, Panama City Market, 215 mm. standard length, 255 total length, recorded by Meek and Hildebrand as *A. strigatus*. These two specimens cannot be confused with *A. sanguineus* because the latter has the first dorsal spine about the same length as the second and a different color pattern.

Dr. John Randall sent a Kodachrome transparency of a 230 mm. specimen taken at Oahu which is intermediate in color pattern between the two illustrations of this species. When alive the specimen was mottled dark brown and bright pink. A specimen captured by him was sent to me and he states that when alive it was "solid bright yellow." Another specimen measuring 195 mm. in standard length was "light yellowish brown" profusely speckled with tiny brown spots. All these specimens (USNM 167508, 167509) came from Oahu.

The speckled and mottled color patterns each may represent different sexes, but I was unable to determine the sex of the specimens.

Antennarius leucosoma Bleeker

PLATE 9,B

Antennarius leucosoma Bleeker, Nat. Tijdschr. Nederlandsch-Indië, vol. 6, p. 328, 1854 (type locality, Flores); Atlas ichthyologique, vol. 5, p. 19, pl. 199, fig. 2, 1865 (Flores; Amboina).

Antennarius multiocellatus leucosoma Günther, Catalog of the fishes in the British Museum, vol. 3, p. 195, 1861 (Amboina and Flores). [Dr. de Beaufort examined Günther's specimen and kindly writes that it is "identical with Bleeker's type in the Leiden Museum."]

Antennarius multiocellatus var. *b.*, Playfair, Proc. Zool. Soc. London, p. 862, 1867 (Seychelles).

This species has a long slender first dorsal spine, much longer than second dorsal spine; bait a tuft of filaments; a movable third dorsal spine; last two rays of soft dorsal divided; no pectoral or pelvic ray divided; anal rays all divided; no naked area behind second dorsal spine and a distinct caudal peduncle; the whitish background color, everywhere profusely marked with tiny black dots, distinguishes this species from all others. I have not seen a specimen of *leucosoma*.

Antennarius pardalis (Cuvier and Valenciennes)

PLATE 9,D

Chironectes pardalis Cuvier and Valenciennes, Histoire naturelle des poissons, vol. 12, p. 420, pl. 363, 1837 (type locality, Gorée [at Dakar, West Africa]).

This species is known from the description and figure of Cuvier and Valenciennes. Their illustration shows all the soft dorsal, pectoral,

and pelvic rays as simple or undivided and all anal rays divided; first dorsal spine longer than second; third movable; caudal peduncle distinct; color dark red, liberally spotted with black and with a few ocellate spots on median fins.

Antennarius chironectes Lacepède

PLATE 10,A,B

Anternnarius chironectes Lacepède, Histoire naturelle des poissons, vol. 1, p. 325, pl. 14, middle fig. 2, 1798 (on Commerson).—Bleeker, Atlas ichthyologique, vol. 5, p. 13, pl. 200, fig. 3, 1865 (Amboina; Banda).

Lophius commersoni Shaw, General zoology or systematic natural history, vol. 5, pt. 2, p. 387, 1804 (type locality, on Commerson in Indian Seas).

Chironectes variegatus Cuvier and Valenciennes, Histoire naturelle des poissons, vol. 12, p. 422, 1837 (on Lacepède; on Commerson).

Lophius sandvicensis Bennett, Narrative of a whaling voyage round the globe . . . , vol. 2, p. 258, fig., 1840 (type locality, Oahu).

?*Chironectes peravok* Montrouzier, Ann. Soc. Agr. Sci. Ind. Lyon, ser. 2, vol. 8, p. 467, 1856 (type locality, Woodlark Island).

Chironectes rubrofuscus Garrett, Proc. California Acad. Nat. Sci., vol. 3, p. 64, 1863 (type locality, Hawaiian Islands).

Chironectes niger Garrett, Proc. California Acad. Nat. Sci., vol. 3, p. 107, 1864 (type locality, Hawaiian Islands).

Antennarius commersoni Bleeker, Atlas ichthyologique, vol. 5, p. 20, pl. 197, fig. 3, 1865 (Ambonia; Ceram).

Antennarius polyophthalmus Bleeker, Natuurk. Tijdschr. Nederlandsch-Indië, vol. 3, p. 644, 1852 (type locality, Banda); Atlas ichthyologique, vol. 5, p. 12, pl. 197, fig. 4, 1865 (Banda; Goram).

Antennarius nigromaculatus Playfair, Proc. Zool. Soc. London, p. 239, 1869 (type locality, Zanzibar).

Antennarius commersoni Günther, Journ. Mus. Godeffroy, pt. 11, pp. 163, 164, pl. 100, figs. B, C, 1876; pt. 13, pls. 101, 102, fig. A, pl. 104, fig. A, pl. 106, fig. B, pl. 105, fig. A, 1877 (Raiatea; Huahine; Hawaiian Islands; Schiffer Island; Bonham Island).

Antennarius commersoni var. *nigromaculatus* Günther, Journ. Mus. Godeffroy, pt. 11, p. 163, 1876; pt. 13, pl. 102, fig. B, 1877 (Zanzibar).

Antennarius commersoni var. *niger* Günther, Journ. Mus. Godeffroy, pt. 11, p. 163, 1876; pt. 13, pl. 103, figs. A, B, 1877 (Hawaiian Islands).

Antennarius commersoni var. *rubrofuscus*, Günther, Journ. Mus. Godeffroy, pt. 11, p. 164, 1876; pt. 13, pl. 106, fig. A, 1877 (Hawaiian Islands).

Antennarius commersoni Günther, Journ. Mus. Godeffroy, p. 164, pt. 13, pl. 104, fig. B, 1877 (Society Island). [This plate shows only 7 pectoral rays, which is most unusual for a species of *Antennarius*; the only other known species having only 7 pectoral rays is *Tathicarpus butleri*. Otherwise pl. 104, fig. B resembles *A. chironectes* as recognized here. I think the drawing to be in error, and until a specimen is available a new name should not be assigned to the drawing.]

Antennarius argus Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 55, p. 172, pl. 8, 1903 (type locality, Zanzibar; holotype ANSP 24208, examined by me).

Antennarius laysanius Jordan and Snyder, Proc. U. S. Nat. Mus., vol. 27, p. 947, 1904 (type locality, Laysan Island).—Jordan and Evermann, Bull. U. S. Fish Comm., vol. 23, pt. 1, p. 520, pl. 63, 1905 (Laysan Island).

Antennarius leprosus (non Eydoux and Souleyet) Jordan and Evermann, Bull. U. S. Fish Comm., vol. 23, pt. 1, p. 519, fig. 228, 1905 (Honolulu).

Antennarius commersoni var. *nigromaculatus* Steindachner, Sitzber. Akad. Wiss. Wien, vol. 115, pt. 1, p. 1413 [reprint p. 45], 1906 (on Günther, Fische der Südsee, pl. 102, fig. A, 1877).

Antennarius polyophthalmus, Smith, The sea fishes of southern Africa, p. 431, pl. 98, fig. 1242, 1949 (Delagoa Bay).

Antennarius glauerti Whitley, Western Australian Nat., vol. 5, No. 7, p. 207, fig., 1957 (type locality, Exmouth Gulf, Western Australia).

The smaller specimens of this species have a naked area behind base of second dorsal spine that becomes completely denticulate in the largest adults, over 200 mm. total length. This latter condition is represented by *A. laysanius* Jordan and Snyder and *A. chironectes* of Bleeker.

This species is widely distributed and variable in color pattern. The first dorsal spine is much longer than second dorsal spine, the third is movable; bait usually consists of a long ribbonlike tentacle and filaments; last two or three soft dorsal rays divided as is the last pelvic ray; anal rays all divided; pectoral rays all simple; caudal peduncle distinct. Color pattern may be black with tips of rays white, or a pale background with a few ocellate spots and scattered blackish spots on body, usually occurring rather constantly on the belly.

I have studied six specimens. From USNM: 63626(1), 75839(1), 89791(1), 92277(1), 126508(1), all from the Hawaiian Islands; 125961(1), Apia.

Antennarius multiocellatus (Cuvier and Valenciennes)

PLATE 10,C

Chironectes multiocellatus Cuvier and Valenciennes, Histoire naturelle des poissons, vol. 12, p. 420, 1837 (type locality, Martinique).

Chironectes mentzelii Cuvier and Valenciennes, Histoire naturelle des poissons, vol. 12, p. 147, 1837 (on a manuscript by Mentzel).

Chironectes principis Cuvier and Valenciennes, Histoire naturelle des poissons, vol. 12, p. 416, 1837 (on a manuscript by Mentzel).

Antennarius annulatus Gill, Proc. Acad. Nat. Sci. Philadelphia, p. 91, 1863 (type locality, Garden Key, Fla.; holotype, USNM 4849).

Antennarius corallinus Poey, Repertorio físico natural de la Isla de Cuba, p. 188, 1865 (type locality, Cuba).

Antennarius stellifer Barbour, Bull. Mus. Comp. Zool., vol. 46, No. 7, p. 132, pl. 4, 1905 (type locality, Castle Harbour, Bermuda).

Antennarius astroscopus Nichols, Bull. Amer. Mus. Nat. Hist., vol. 31, art. 11, pp. 109–111, fig. 1, 1921 (type locality, Barbados).

Antennarius multiocellatus Barbour, Proc. New England Zool. Club, vol. 19, pp. 27, 37, pls. 10, 11, 13, 14, 16 (fig. 2), 17 (fig. 5), 1942 (Gulf Stream; Bahamas; Florida; Cuba; Bermuda; Yucatan; Barbados).

This species has the first dorsal spine slender and much longer than the second dorsal spine, the former bears at its tip the filamentous bait; third dorsal spine movable; sometimes none but usually last

two soft dorsal rays divided, last pelvic ray divided; anal rays all divided; pectoral rays all simple; naked area behind second dorsal spine; caudal peduncle distinct.

There are two color-phases, one has a pale or light brownish background with black ocellate spots located in characteristic places as follows: basally on middle of anal fin; basally on soft dorsal rays 8 to 10; black spot each side of base of third dorsal spine; a few smaller black spots on caudal, dorsal, and pectoral fins; sides of body with several small scattered black spots; belly unspotted; a whitish or pale saddle on dorsal edge of caudal peduncle, especially notable in blackish color-phase. The blackish color-phase, in addition to the white peduncular spot, has one at rear of head, a small one on side just behind head, and another one at rear corner of mouth; the black spots may show as deeper black through the background color.

The shorter first dorsal spine, more numerous pectoral fin rays, and large ocellate spot on side of body of *A. ocellatus* distinguishes that species from *multiocellatus*.

I have studied eight specimens. From USNM: 4849, holotype of *A. annulatus* Gill; 39898 (1), Bahamas; 107351(1), Cuba; 116760(1), and 116763(1), Tortugas; 34447(1), unknown locality; 27561(1), dried specimen from St. Thomas, Virgin Islands. From CNHM: 48720(1), Bermuda.

Antennarius oligospilos Bleeker

PLATE 11,B

Antennarius oligospilos Bleeker, Acta Soc. Sci. Indo-Neerlandicae, vol. 2, p. 70, 1857 (type locality, Amboina); Atlas ichthyologique, vol. 5, p. 11, pl. 195, fig. 1, and pl. 200, fig. 1, 1865 (Amboina; Ceram; New Guinea).—Smith, The sea fishes of southern Africa, p. 431, pl. 98, fig. 1241, 1949 (Durban; Delagoa Bay).

This species was distinguished by Bleeker on the basis of "warts" on the skin. *A. oligospilos* is similar to *A. commersoni* except for the warts, and the last pelvic ray is unbranched. It resembles *A. phymatodes* Bleeker in regard to warts on the skin but that species does not have any branched rays except those of the caudal fin. I have not seen a specimen.

Antennarius sanguineus Gill

PLATE 10,D

Antennarius sanguineus Gill, Proc. Acad. Nat. Sci. Philadelphia, p. 91, 1863 (type locality, Cape San Lucas; 2 types, USNM 6393).

Antennarius leopardinus Günther, Proc. Zool. Soc. London, p. 151, 1864 (type locality Pacific Coast, Panamá); Trans. Zool. Soc. London, vol. 6, pt. 7, pl. 69, fig. 3, 1869 (Panamá).

Antennarius tagus Heller and Snodgrass, Proc. Washington Acad. Sci., vol. 5, p. 226, p. 20, 1903 (type locality, Tagus Cove, Albemarle Island, Galápagos).

First dorsal spine about same length as the second, which has a "hooked tip," third dorsal spine bound down by skin and not movable in adults but somewhat movable in the young; naked area behind second dorsal spine; only last two or three soft rays of dorsal branched or divided, only last ray of pelvic divided; caudal peduncle scarcely or not distinct; none of pectoral rays branched; anal rays all divided; background coloration light tan or light brown, overlaid with dark brown spots, more numerous and larger ventrally, especially larger on belly; a small ocellate spot basally on soft dorsal; fins with small brown spots.

I have studied five specimens of *A. sanguineus* in addition to the types. From USNM: 18604(1), Cape San Lucas; 101755(1), Gorgona Island, Colombia. From CNHM: 41442(1), Albemarle Island, Galápagos; 60276(1), Gulf of Nicoya, Costa Rica; 60278(1), Acapulco, México.

Antennarius drombus Jordan and Evermann

PLATE 11,C,D.

Antennarius drombus Jordan and Evermann, Bull. U. S. Fish Comm., vol. 22, p. 207, 1903 (type locality, Waikiki, near Honolulu; holotype, USNM 50659); Ibid., vol. 23, p. 521, pl. 64, 1905 (Waikiki).

Antennarius nexilis Snyder, Bull. U. S. Fish Comm., vol. 22, p. 537, pl. 13, fig. 23, 1904 (type locality, Honolulu; holotype, USNM 50883).—Jordan and Evermann, Bull. U. S. Fish Comm., vol. 23, pt. 1, p. 523, pl. 65, fig. 1, 1905 (Honolulu).

First dorsal spine about same length as second; latter without a definite naked area behind its base, although sometimes it is partly naked; third dorsal spine bound down with skin, scarcely movable; last two or three soft dorsal and last pelvic ray divided; none of pectoral rays divided; anal rays all divided; caudal peduncle scarcely present; color dark brown with darker brown or blackish spots on body and fins; no ocellate spot on soft dorsal.

In addition to the two holotypes, I have studied 12 specimens. From USNM: 119772(1), from Cocos Island, Eastern Pacific; 160709(2), Hawaii; 167510(1), Oahu. Dr. John Randall sent me a Kodachrome transparency taken of a Oahu specimen. The fish was profusely blackspotted after preservation. When alive it had "many conspicuous pink areas" and the blackish spots were not distinct. Dr. Robert R. Harry loaned to me 8 specimens collected by him from the reefs on the northwest side of Laysan Island, June 27–July 3, 1951, while he was with the George Vanderbilt Pacific Equatorial Expedition.

Antennarius coccineus (Lesson)

PLATE 12,A

Chironectes coccineus Lesson, Voyage autour du monde, *La Coquille*, Zool., vol. 2, pt. 1, p. 143, pl. 16, fig. 1, 1830 (type locality, Mauritius) [Dr. de Beaufort examined the type of this species and in a letter stated "the dorsal and anal end close to base of caudal;" therefore, Lesson's figure 1 is inaccurate].—Cuvier and Valenciennes, Histoire naturelle de poissons, vol. 12, p. 430, 1837 (on Lesson).

Antennarius coccineus Bleeker, Atlas ichthyologique, vol. 5, p. 22, pl. 197, fig. 2, 1865 (Java; Cocos; Nias; Singapura; Sangi; Buro; Amboina; Ceram; Goram).—Smith, The sea fishes of southern Africa, p. 431, pl. 98, fig. 1238, 1949 (Natal).

Antennarius stigmaticus Ogilby. Mem. Queensland Mus., vol. 1, p. 63, pl. 14, fig. 2, 1912 (type locality, Moreton Bay, Queensland).

Antennarius leucas Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 86, p. 512, fig. 53, 1934 (type locality, Durban, Natal, holotype ANSP 54955, examined by me).

Antennarius punctatissimus Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 98, p. 216, fig. 76, 1946 (type locality, Aguni Shima, Riu Kiu Islands, holotype ANSP 72089, examined by me).

This species has first dorsal spine short, about same length as second, with naked area behind second dorsal spine; third dorsal spine partly bound down with skin and only partly movable; only the last two or three soft dorsal rays and last pelvic rays divided; pectoral rays all simple, undivided; anal rays all divided; caudal peduncle absent or nearly so; background color light tan, somewhat marbled or profusely peppered with dark dots; occasionally a trace of a dark spot near midbase of soft dorsal on young and those as large as 32 mm. in standard length.

I have studied 24 specimens. From USNM: 113988(1), 113989(1), 113986(1), 113987(3), 113990(1), all from Bikini Atoll; 167506(1), Onotoa Atoll; 164193(1), Arnol Atoll; 52280(1), Samoan Islands; 133868(1), Tonga Island, Paumotu. From University of Washington: 1 from Bikini Atoll. From Chicago Natural History Museum: 1 from the Marshall Islands. From Dr. Robert R. Harry: 6 from Ifaluk Atoll; 4 from Kapingamarangi Atoll. From Dr. John Randall: 1 from Moorea, Society Islands.

Antennarius dorehensis Bleeker

PLATE 12,B

Antennarius dorehensis Bleeker, Acta Soc. Sci. Indo-Neerlandicae, vol. 6, p. 21, 1859 (type locality, New Guinea); Atlas ichthyologique, vol. 5, p. 19, pl. 199, fig. 7, 1865 (Doreh, New Guinea).

This species with the first dorsal spine about same length as second, bait a tuft of filaments, has about the last four soft dorsal rays divided;

none of pelvic or pectoral rays divided; anal rays all divided; caudal peduncle distinct. Background coloration blackish, everywhere speckled with white dots. This species is known from Bleeker's description and figure. I have not seen a specimen nor have I seen the specimens reported upon as this species by Herre (Copeia, No. 3, p. 149, 1945) from Estancia, Panay.

Antennarius bermudensis, new species

PLATE 12,c

HOLOTYPE: USNM 50000, Hungry Bay, Bermuda (Paget County), F. Goodwin Gosling, standard length 51 mm., total length 65 mm.

PARATYPE: CNHM 48862, Harrington Sound, Bermuda, April 1931, L. L. Mobray, standard length 61.5 mm., total length about 79 mm.

DESCRIPTION: The following counts were made on the holotype and paratype respectively: Dorsal I–I–I,12 and I–I–I,12; anal 7 and 7; pectoral 9–9 and 10–10; pelvics 5 and 5; caudal 4+5 and 4+5.

The following characters are recorded in thousandths of the standard length, for the holotype and paratype, respectively. Standard length 51 and 61.5 mm. Greatest depth of body 686 and 650; length of bony part of first dorsal spine 118 and 114; of second dorsal spine 127 and 114; of third dorsal spine 225 and 195; longest soft dorsal ray 223 and 276; longest (middle) caudal ray 275 and 276; length of head (tip of snout to gill opening) 628 and 634; length of maxillaries 260 and 293; least depth of caudal peduncle 123 and 130; length of caudal peduncle (distance between vertical lines through caudal fin base and rear of membranous bases of anal and dorsal fins) 27 and 29; length of base of soft dorsal fin 461 and 495; eye diameter 59 and 55; interorbital space 184 and 163.

The bony part of first dorsal spine about same length as second dorsal spine, bearing filaments at its tip; second dorsal spine curved, covered with denticles and with tentacles; third dorsal spine bound down with skin except its tip, scarcely movable; area behind base of second dorsal spine naked; all soft dorsal rays simple except last two may or may not be divided; anal and caudal rays all divided, pectoral rays all simple; only last pelvic ray branched; caudal peduncle almost absent; body and head profusely covered with denticles.

COLOR IN ALCOHOL: Background color brownish above, very light tan on belly; everywhere speckled with darker brown; median fins somewhat barred; a large ocellate spot basally on soft dorsal rays 8 to 11 more on body than on base of fin; lateral line with dark brown spots; pectoral and pelvic fins with dark spots.

REMARKS: This new species may be distinguished by the key from all others referred to the genus *Antennarius*. It is most closely related

to *drombus* and *coccineus* of the Pacific, differing in having one more soft dorsal ray and an ocellate spot on the soft dorsal, absent in the two species from the Pacific.

Named in reference to the island group where the type was collected.

Antennarius notophthalmus Bleeker

PLATE 13,A,B

Antennarius notophthalmus Bleeker, Nat. Tijdschr. Nederlandsch-Indië, vol. 5, p. 544, 1853 (type locality, Java); Atlas ichthyologique, vol. 1, p. 16, pt. 196, fig. 1, 1865 (Java; Nias; Celebes; Batjan; Amboina; Ceram).

Antennarius biocellatus (non Cuvier 1817) Bleeker, Acta Soc. Sci. Indo-Neerlandicae, vol. 8, p. 4, 1860 (type locality, Amboina); Atlas ichthyologique, vol. 5, p. 18, pl. 194, fig. 3, pl. 198, fig. 5, 1865 (Amboina).—Smith, The sea fishes of southern Africa, p. 431, pl. 98, fig. 1237, 1949 (East London to Delagoa Bay).

This species with first dorsal spine about as long as second has the bait composed of a tuft of filaments; none of pelvic or pectoral rays divided; last two or three soft dorsal rays divided; anal rays all divided; caudal peduncle distinct; background coloration brownish, sometimes overlaid with a coarse network of darker brown marks; or mottled and spotted with brown; usually a dark bar or saddle between third dorsal spine and soft dorsal origin, usually an ocellate spot posterobasally on soft dorsal fin.

I have studied two specimens. From USNM: 133169(1) and 150949(1) from the Philippines.

Antennarius verrucosus Bean

PLATE 12,D

Antennarius verrucosus Bean, Proc. Biol. Soc. Washington, vol. 19, p. 31, 1906 (type locality, St. George Island, Bermuda).

This species, with first dorsal spine about same length as second, has the bait consisting of a tuft of filaments; third dorsal spine movable; naked area behind base of second dorsal spine; caudal peduncle distinct; last two or three soft dorsal rays divided; last pelvic ray divided; anal rays all divided; none of pectoral rays divided; background color light tan, overlaid with brown streaks and bars, those dorsally with pale centers; fins brown-spotted, those on dorsal and caudal fins with pale centers.

I have studied two specimens. From USNM: 164244(1), Bermuda. From CNHM: 46818(1), Florida.

Antennarius altipinnis Smith and Radcliffe

PLATE 13,C

Antennarius altipinnis Smith and Radcliffe, *in* Radcliffe, Proc. U. S. Nat. Mus., vol. 42, p. 204, fig. 3, 1912 (type locality, Nogas Point, Panay, Philippines; holotype, USNM 70267).

Antennarius albomarginatus Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 97, p. 74, fig. 19, 1945 (type locality, Saipan Island; type, Academy of Natural Sciences of Philadelphia (ANSP) No. 71609, examined by me).

Antennarius niveus Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 98, p. 215, fig. 75, 1946 (type locality, Aguni Shima, Riu Kiu Islands; type, ANSP 72088, examined by me).

This rather common species in the Philippines has the first dorsal spine shorter than the second dorsal spine, and the bait consists of a tuft of filaments; no naked area behind second dorsal spine; last two or three soft dorsal rays divided, as is the last pelvic ray; anal rays all divided; all of pectoral rays undivided; third dorsal spine somewhat bound down by skin but movable; caudal peduncle distinct but short; background coloration brownish and somewhat dark-spotted; cirri on body usually whitish; median fins notably dark brown except distally with broad white or pale edges; pale bar across caudal fin basally is a characteristic mark.

In addition to the types, I have studied 16 specimens. From USNM: 122342(1), 122811(2), 122343(1), 122344(1), 122808(2), 122809(1), 150939(1), 150950(1), 150995(1), all from the Philippines; 154625(1), Guam; 164196(1), Palau Islands. From Australian Museum, Sydney, 1 from Gilbert Islands. From ANSP: 71818(1), Fiji. From Dr. R. R. Harry: 2, collected by him at Kapingamarangi Atoll in 1954.

Antennarius pauciradiatus, new species

FIGURE 7

Antennarius pleurophthalmus (non Gill) Longley and Hildebrand, Papers Tortugas Lab., vol. 34, p. 308, 1941 (Tortugas, Fla., only the 40 and 42 mm. specimens).

HOLOTYPE: USNM 153226, off Palm Beach, Fla., in 30 to 40 fathoms on rocky reef, August 1950, collected by Thompson and McGinty, standard length 20 mm. and total length 28 mm.

PARATYPES: USNM 82583, off Cape San Antonio, Cuba, May 24, 1914, Bartsch and Henderson, 1 specimen, 16.5 mm.; USNM 153146, off Palm Beach, Fla., 1950, McGinty, 2 specimens, 13.8 and 15.5 mm.; USNM 153147, off Palm Beach, Fla., 20 to 30 fathoms, April 1950, Thompson and McGinty, 2 specimens, 12.5 and 15.5 mm.; USNM 153148, off Palm Beach in 20 fathoms, March 1950, McGinty, 1 specimen, 12 mm.; USNM 153223, off Palm Beach, Fla., sand and rocky reef, Aug. 2, 1950, Thompson and McGinty, 2 specimens, 21 and 26.5 mm.; CNHM 50249, South end of Biscayne Bay, Fla., W. B. Grey, July–August 1949, 2 specimens, 35 and 40 mm. (in poor condition); USNM 116764, Tortugas, Fla., W. H. Longley, 2 specimens, 30 and 31 mm. (40 and 42 mm. total length).

DESCRIPTION: The following counts were made on the holotype (additional counts are recorded in table 1): Dorsal rays I–I–I–12; anal 7; pectoral 9–10.

The following characters are recorded in thousandths of the standard length for the holotype and one paratype, respectively: Standard length 20 and 30 mm. Greatest depth of body 600 and 550; length of bony part of first dorsal spine 55 and 50; of second dorsal spine 110 and 97; of third dorsal spine 325 and 297; longest soft dorsal ray 270 and 300; longest (middle) caudal ray 425 and 417; length of head (tip of snout to gill opening) 600 and 600; length of maxillaries 215 and 220; least depth of caudal peduncle 150 and 147; length of caudal peduncle (distance between vertical lines thru caudal fin base and rear of membranous bases of anal and dorsal fins) 90 and 100; length of base of soft dorsal fin 550 and 584; eye diameter 95 and 67; interorbital space 110 and 93.

The bony part of first dorsal spine much shorter than second dorsal spine, bearing at its tip a tuft of filaments; second dorsal spine curved and short; third dorsal spine notably much longer than second; both second and third spines with membranes behind; the third spine becoming partly bound down to body on the largest specimens (26.5 and 40 mm.) but still somewhat movable; only last two or three soft dorsal rays divided; only last pelvic ray divided; caudal rays all

FIGURE 7.—*Antennarius pauciradiatus*, new species. Drawing by Mrs. A. M. Awl of holotype, USNM 153226, from Florida.

branched; anal rays all branched; pectoral rays all simple; gill opening close to base of pectoral fin; caudal peduncle distinct; skin with fine denticles almost everywhere on body and head; scattered dermal cirri present.

Color in alcohol: Background coloration almost whitish, somewhat tinged with pink, larger specimens light tan; a few dark dots present on a few specimens mostly on head and fins; the most characteristic mark is a small ocellate spot basally on soft dorsal fin between rays 8 to 10.

Remarks: This new species has been confused with *A. radiosus*, *A. multiocellatus*, and *A. ocellatus*, all of the Western Atlantic. The reason for this confusion is the presence of an ocellate spot in the soft dorsal fin of these four species. *A. radiosus* has 13 or 14 pectoral rays and *A. ocellatus* has 11 to 13, whereas the new species has only 8 to 10, usually 9. *A. multiocellatus* differs from *A. pauciradiatus* in having 10 pectoral rays instead of 9, rarely 10, and in addition the first dorsal spine of *multiocellatus* is much longer than the second.

This new species is named in reference to the fewer pectoral rays as compared with closely related species in the Western Atlantic.

Antennarius nummifer (Cuvier)

Figure 8

Chironectes nummifer Cuvier, Mém. Mus. Hist. Nat. Paris, vol. 3, p. 430, pl. 17, fig. 4, 1817 (no locality given); Cuvier and Valenciennes, Histoire naturelle des poissons, vol. 12, p. 425, 1837 (coast of Malabar).

Antennarius sanguifluus Jordan, *in* Jordan and Sindo, Proc. U. S. Nat. Mus., vol. 24, p. 374, fig. 5,[1] 1902 (type locality, Misaki, Japan; holotype, USNM 49820)—Jordan, Tanaka and Snyder, Journ. Coll. Sci. Tokyo Imp. Univ., vol. 23, art. 1, p. 424, fig. 393, 1913 (Japan).—Okada and Matsubara, Keys to the fishes and fishlike animals of Japan, p. 457, pl. 112, fig. 2, 1938 (Japan).

The first dorsal spine, about the same length as second, has the bait consisting of a tuft of filaments; area behind second dorsal spine naked; third dorsal spine movable, tip hooked or nearly so; last 2 or 3 soft dorsal rays and last pelvic ray divided; all pectoral rays simple; anal rays all divided; caudal peduncle distinct; background coloration light tan or brownish, somewhat mottled with darker brown; large ocellate spot posterobasally on soft dorsal fin between rays 7 and 9; tentatively, I refer CNHM 51864 to this species as it agrees in every respect except its generally blackish color. Since other species of *Antennarius* apparently have a black color phase, I presume it could happen in this one too. Series of antennariids are not available for the study of such problems.

[1] Drawing in error; last pelvic ray is divided in the holotype.

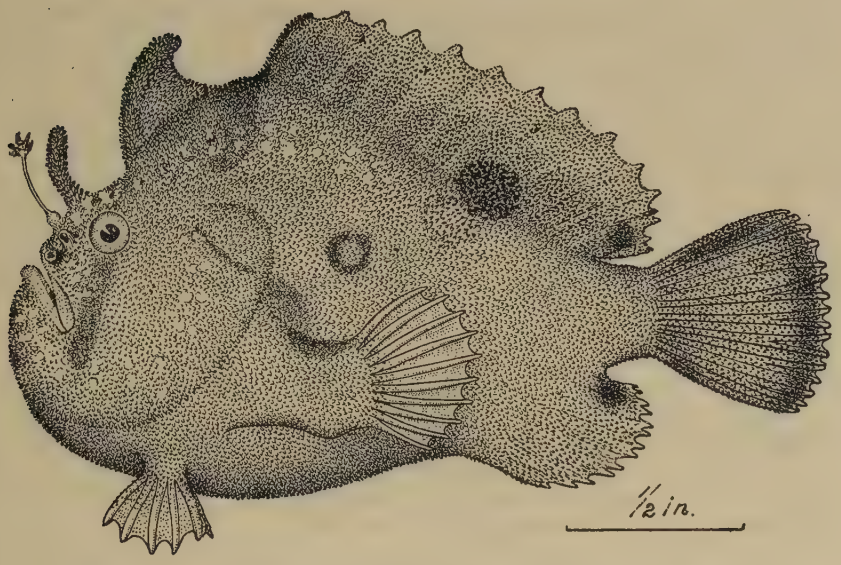

FIGURE 8.—*Antennarius nummifer* (Cuvier). Drawing of type of *A. sanguifluus* retouched by author.

In addition to the holotype of *A. sanguifluus*, I have studied 21 specimens. From USNM: 167505(1), Onotoa Atoll, Gilbert Islands, collected by Dr. John Randall. From CNHM: 2487(6) and 5752(3) both from Persian Gulf; 51864(1), Sandakan District, Northern Borneo. Dr. R. A. Harry loaned 10 specimens from the Caroline Islands.

Subfamily Histrioninae

Genus *Histrio* Fischer

Histrio Fischer, Zoognosia, ed. 3, vol. 1, pp. 70, 78, 1813 (genotype, *Lophius histrio* Linnaeus).

Pterophryne (non *Pterophrynus* Lütken 1863) Gill, Proc. Acad. Nat. Sci. Philadelphia (1863), p. 90, 1864 (genotype, *Chironectes laevigatus* Cuvier).

Pterophrynoides Gill, Proc. U. S. Nat. Mus., vol. 1, p. 216, 1878 (genotype, *Lophius histrio* Linnaeus; proposed to replace *Pterophryne* Gill).

Histrio histrio (Linnaeus)

PLATE 13,D

Lophius histrio Linnaeus, Systema naturae, ed. 10, p. 237, 1758 (type locality, pelagic in *Fucus*).—Shaw, General zoology, vol. 5, pt. 2, p. 384, pl. 164, 1804 (Indian and American Seas).—Smith, Sea fishes of southern Africa, p. 431, pl. 98, fig. 1243, 1949 (pelagic).

?*Lophius marmoratus* Shaw and Nodder, Naturalist's miscellany, vol. 5, pl. 176, 1794 (no locality).

?*Lophius pictus* Shaw and Nodder, Naturalist's miscellany, vol. 5, pl. 176, 1794 (no locality).

Lophius raninus Tilesius, Mém. Soc. Nat. Moscou, vol. 2, p. 245, pls. 16, 17, 1809 (no locality).

Lophius cocinsinensis Shaw and Nodder, Naturalist's miscellany, vol. 23, pl. 1012, p. ?, 1812 (type locality, Indian Seas).

Lophius gibbus Mitchill, Trans. Lit. Philosoph. Soc. New York, vol. 1, pl. 4, fig. 9, 1815 (no locality given).

Chironectes laevigatus Cuvier, Mém. Mus. Hist. Nat. Paris, vol. 3, p. 423, pl. 16, upper fig., 1817 (type locality, Atlantic Ocean).

Lophius histrio marmoratus Bloch and Schneider, Systema ichthylogiae, p. 142, 1801 (no locality given).

Lophius geographicus Quoy and Gaimard, Voy. *Uranie . . . Physicienne*, Zool., p. 355, pl. 65, fig. 3, 1824 (type locality, New Guinea).

Lophius histrio pictus Bloch and Schneider, Systema ichthyologiae, p. 142, 1801 (no locality).

Chironectes pictus Cuvier and Valenciennes, Histoire naturelle des poissons, vol. 12, p. 393, pl. 363, 1837 (middle of Atlantic).

Chironectes tumidus Cuvier and Valenciennes, Histoire naturelle des poissons, vol. 12, p. 397, 1837 (type locality, Atlantic).

Chironectes arcticus Düben and Koren, Kongl. Vet. Akad. Handl., p. 72, pl. 3, figs. 4, 5, 1844 (type locality, Atlantic).

Chironectes pictus var *vittatus* Richardson, Voy. *Erebus* and *Terrior*, Fishes, p. 15, pl. 9, figs. 3, 4, 1844 (type locality, tropical Atlantic).

Chironectes sonntagii Müller, Reisen in den Vereinigten Staaten, Canada und Mexico, vol. 1, pt. 2, p. 180, 1864 (type locality, Gulf Stream).

Antennarius inops Poey, Anal. Soc. Española Hist. Nat., vol. 10, p. 340, 1881 (type locality of holotype, USNM 37434, Puerto Rico).

Histrio jagua Nichols, Proc. Biol. Soc. Washington, vol. 33, p. 62, 1920 (type locality, Bermuda.)

Histrio gibba, Longley and Hildebrand, Papers Tortugas Lab., vol. 34, p. 303, pl. 34, 1941 (Panamá; West Indies; Florida).

Pterophrynoides histrio Whitley, Rec. Australian Mus. vol. 17, p. 137, pl. 31, fig. 4, 1929 (New South Wales).—Koefoed, Rep. Sci. Results *Michael Sars* North Atlantic Deep-Sea Exped., 1910, vol. 4, pt. 2, No. 1, p. 3, pl. 3, figs. 1, 2, 1944 (North Atlantic).

I have compared specimens from the Atlantic, East and West Pacific, and Indian Oceans and did not find any significant differences throughout the entire range in tropical marine waters. I conclude that only one species is represented.

The largest Atlantic specimen observed by me measures 106 mm. in standard length and a total length of 140 mm. In the Pacific, one from the Philippines is 140 mm. standard length and 195 mm. in total length.

I have studied 452 specimens, as follows:

ATLANTIC OCEAN

Western Atlantic Ocean: USNM 4880(1), 21250(1), 38043(1), 39474(6), 44245(1), 82620(2), 83863(33), 92639(1), 92689(1), 92691(2), 92749(1); CNHM 34216(1), 34219(1), 34220(1).

Gulf of Maine: USNM 164190(8), 164191(4).

Massachusetts: USNM 20661(1), 125415(5).

Delaware: USNM 87584(1).

North Carolina: USNM 53257(6), 73535(1).

South Carolina: USNM 131631(1).

Florida: USNM 18045(1), 49587(1), 49704(1), 88097(1), 89368(2), 89712(1), 89713(1), 89788(1), 92219(1), 116765(9), 116766(1), 119123(1), 126789(1), 134017(4), 134323(1), 135674(4), 155494(1), 163948(1), 164183(1), 164185 to 164189(5); CNHM 16156(1), 21703(1), 46140(1), 46895(1), 50219(1), 50250(1), 50261(4).

Carribbean, Bahamas, West Indies, Curaçao: USNM 20420(6), 37544(1), 53259(3), 38766(1), 53258(1), 53260(7), 53261(1), 108326(1), 108327(1), 108370(1), 128801(1), 132620(1), 133908(1), 164177(2), 164184(20); CNHM 50259(1), 60277(1).

Gulf of Mexico: USNM 37239(1), 73588(1), 84579(1), 84580(1), 120233(1), 131525(1), 133880(1), 164178(1), 164180(2), 164181(3), 164182(1); CNHM 35361 to 35365(5).

Panamá (Atlantic): USNM 81781(1), 81788(1).

Bermuda: USNM 105268(3); CNHM 5290 to 5293(4), 8550(1), 48213(1), 48252(1), 48358(1), 48516(1), 48545(1), 48581(1), 48601(1), 48805(1), 48894(26), 49176(1), 49177(1), 49178(1).

Trinidad: USNM 164179(1).

PACIFIC OCEAN

Galápagos Islands: USNM 20403(2), 84612(6), 92698(1).

Hawaiian Islands: USNM 82842(2).

Japan: USNM 76259(2); CNHM 55403(1).

China: USNM 56401(5).

Philippine Islands: USNM 56315(1), 122385(16), 122543(1), 122817(170), 122818(2).

Australia (Newcastle): USNM 150941(1).

New Scientific Names

Following is a list of new scientific names appearing in this paper.

Kanazawaichthys, new genus (p. 62)

Kanazawaichthys scutatus, new species (p. 63)

Nudiantennarius, new genus (p. 66)

Abantennarius, new genus (p. 66)

Abantennarius analis Gosline, new species (p. 67)

Triantennatus, new subgenus (p. 74)

Phrynelox zebrinus, new species (p. 75)

Phrynelox atra, new species (p. 76)

Antennatus, new genus, new subgenus (p. 80)

Xenophrynichthys, new subgenus (p. 81)

Uniantennatus, new subgenus (p. 83)

Plumantennatus, new subgenus (p. 89)

Antennarius bermudensis, new species (p. 98)

Antennarius pauciradiatus, new species (p. 100)

U. S. GOVERNMENT PRINTING OFFICE: 1957

A, *Tathicarpus butleri* Ogilby, after holotype of *T. appeli* Ogilby; B, *Trichophryne rosaceus* (Smith and Radcliffe), holotype, USNM 70266. C, *Trichophryne michelli* (Morton) after McCulloch and Waite 1918. D, *Nudiantennarius subteres* (Smith and Radcliffe) after holotype, USNM 70268.

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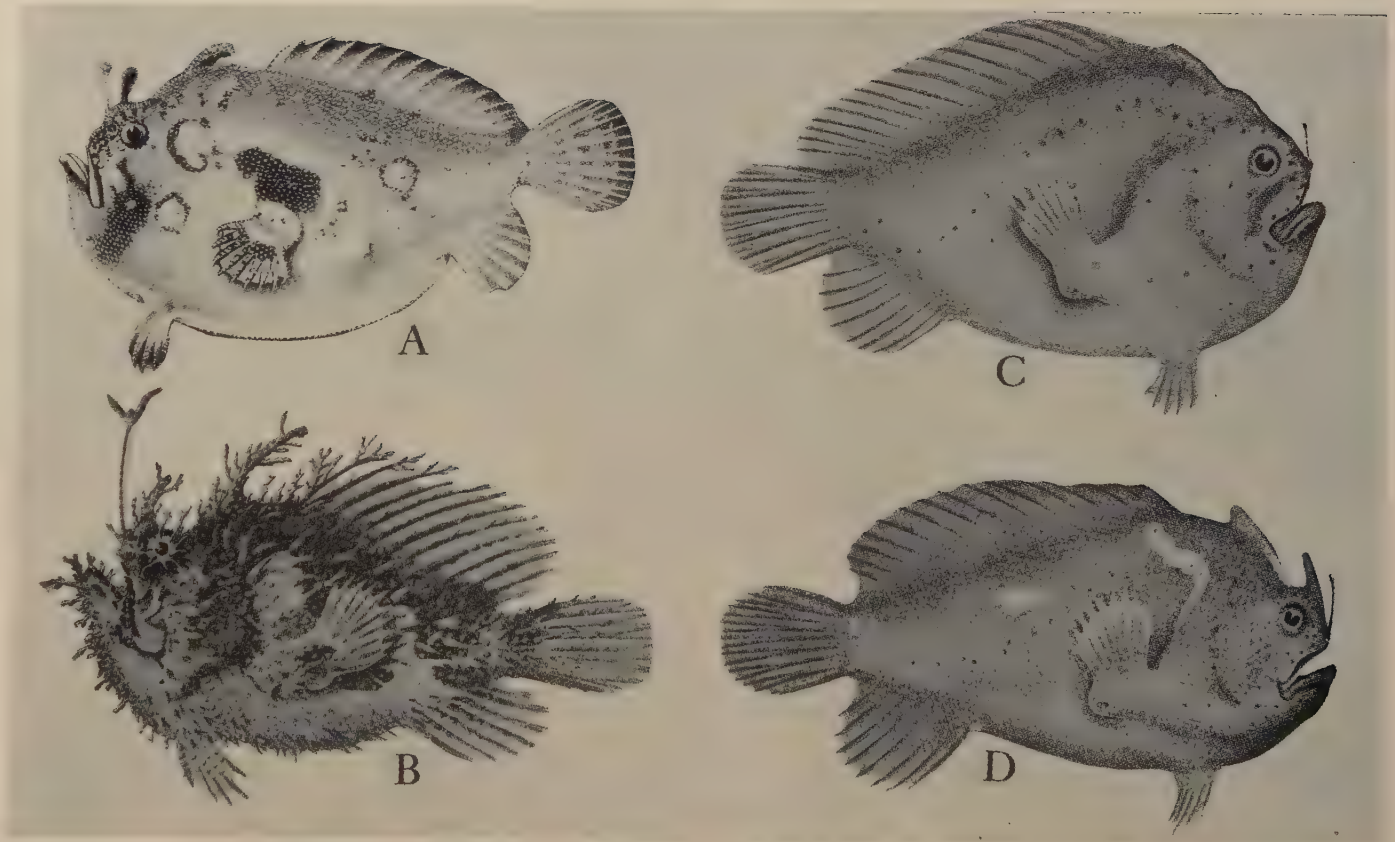
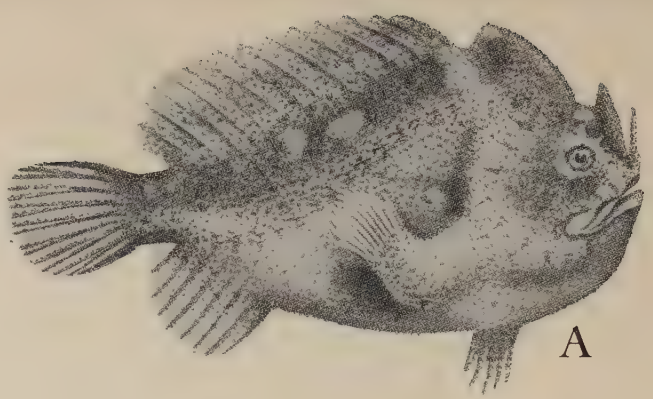
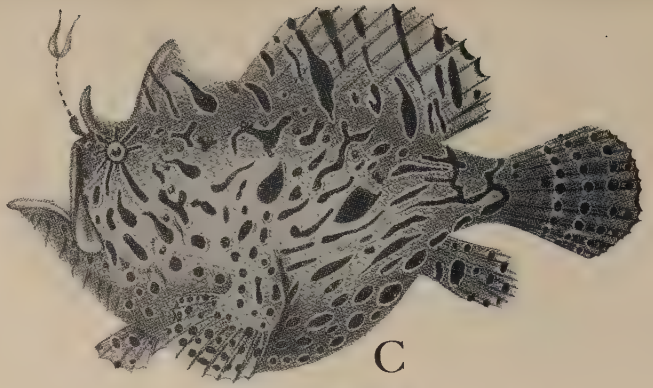
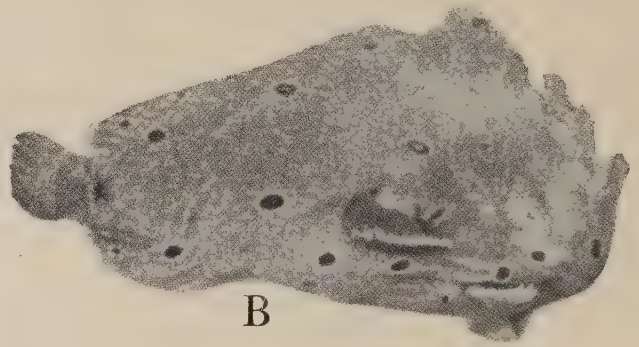
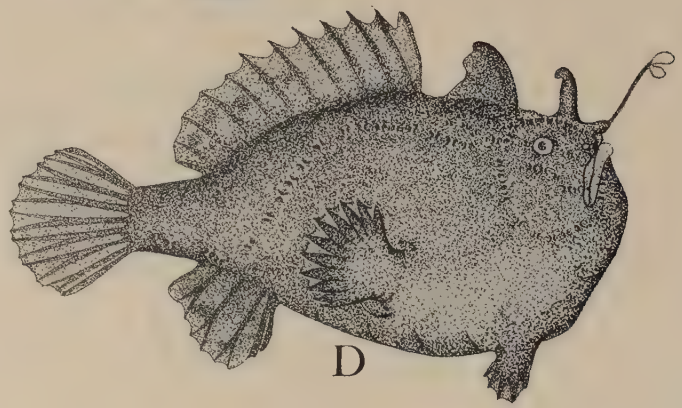


A, *Abantennarius duescus* (Snyder), after Snyder, holotype, USNM 50884. B, *Rhycherus filamentosus* (Castelnau), after McCulloch and Waite 1918. C, *Histiophryne bougainvilli* (Cuvier and Valenciennes), after McCulloch and Waite 1918. D, *H. scortea* McCulloch and Waite, after figure by authors.

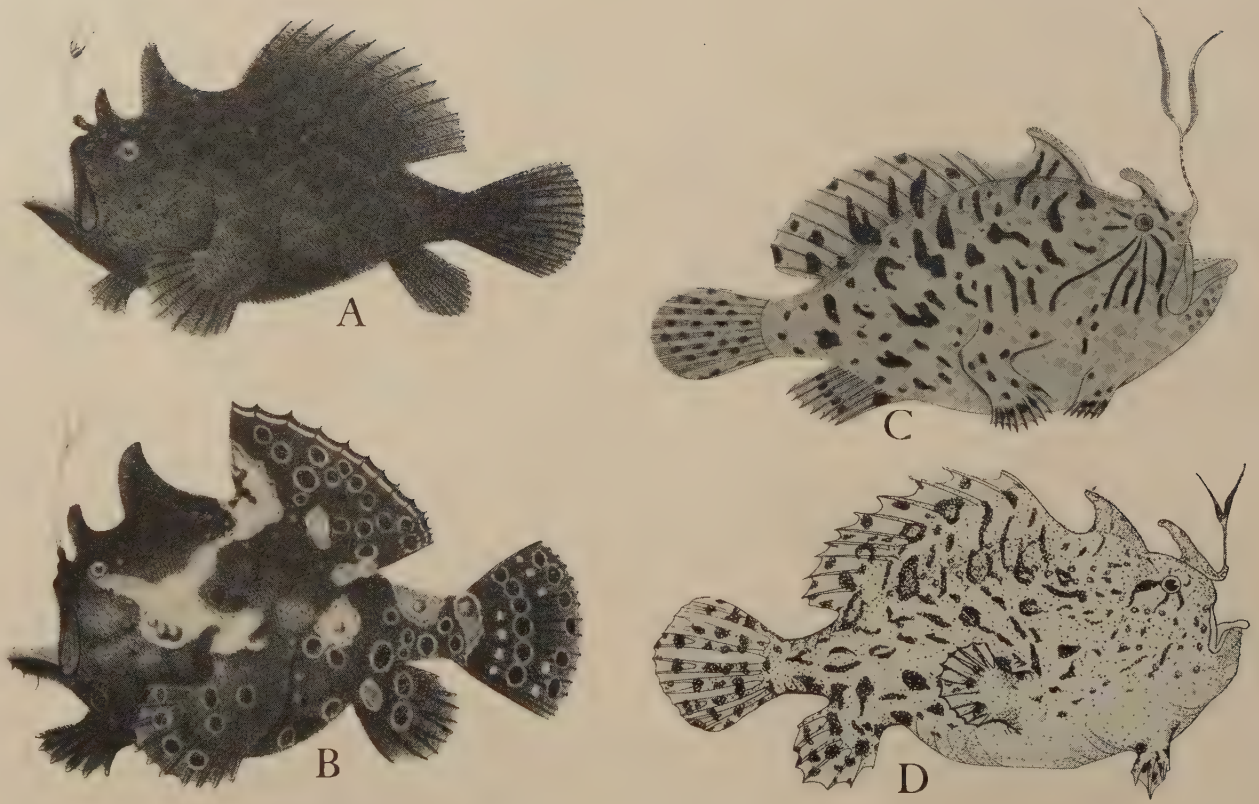




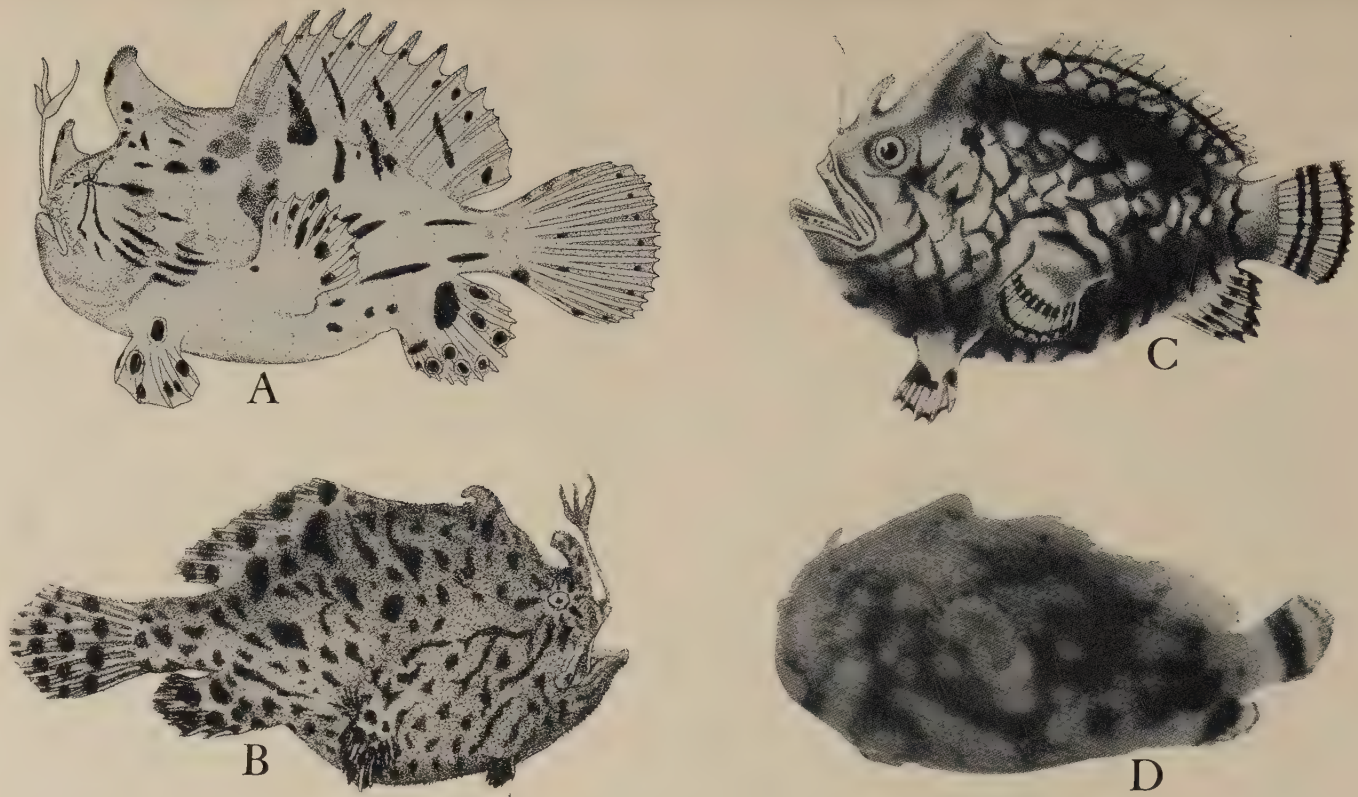




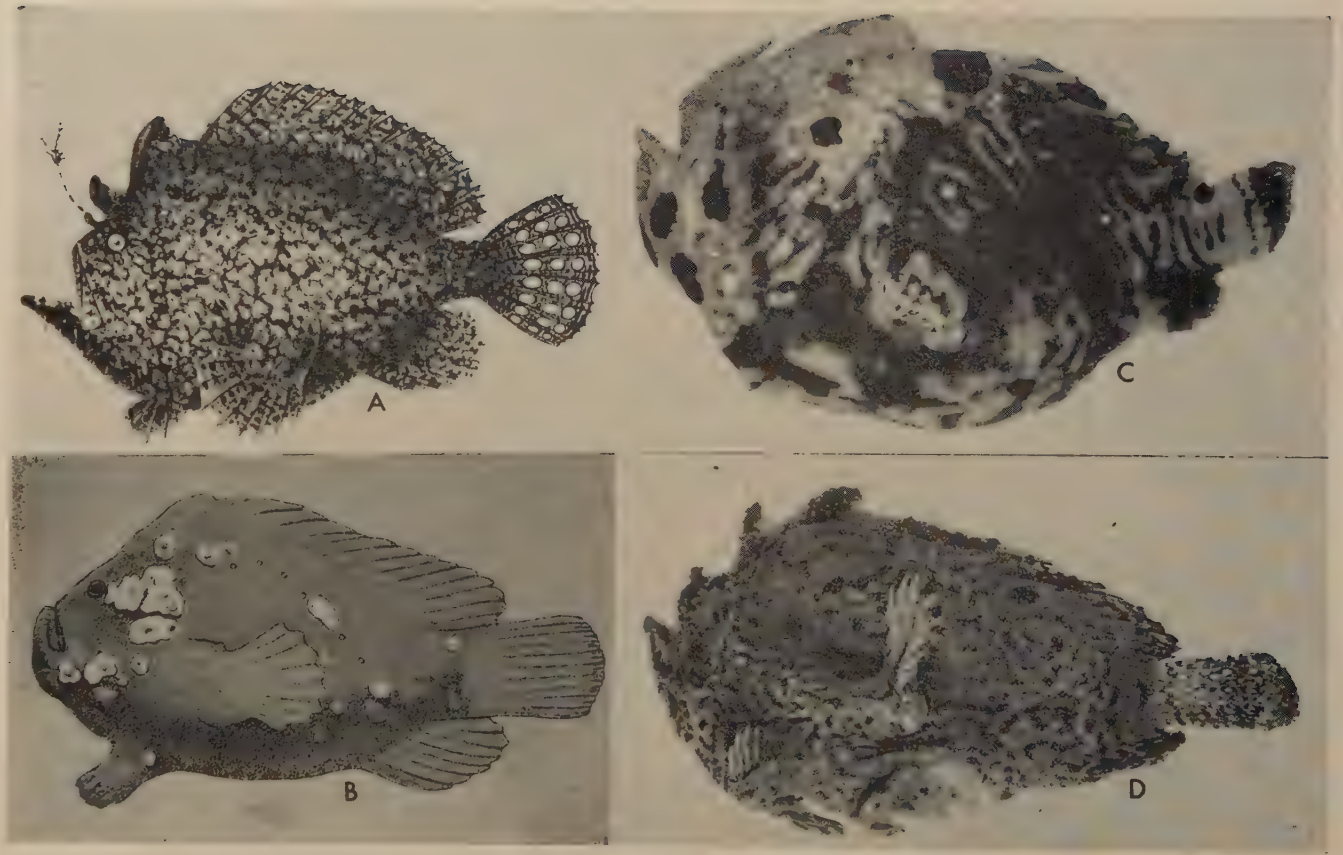
A, *Echinophryne crassispina* McCulloch and Waite, after holotype by authors. B, *E. glauerti* Whitley, after Whitley 1944. C, *Phrynelox striatus* (Shaw), after Bleeker (Atlas, vol. 5, pl. 197, fig. 5, on *A. pinnaceps*). D, *Phrynelox nuttingi* (Garman), after Barbour 1942.



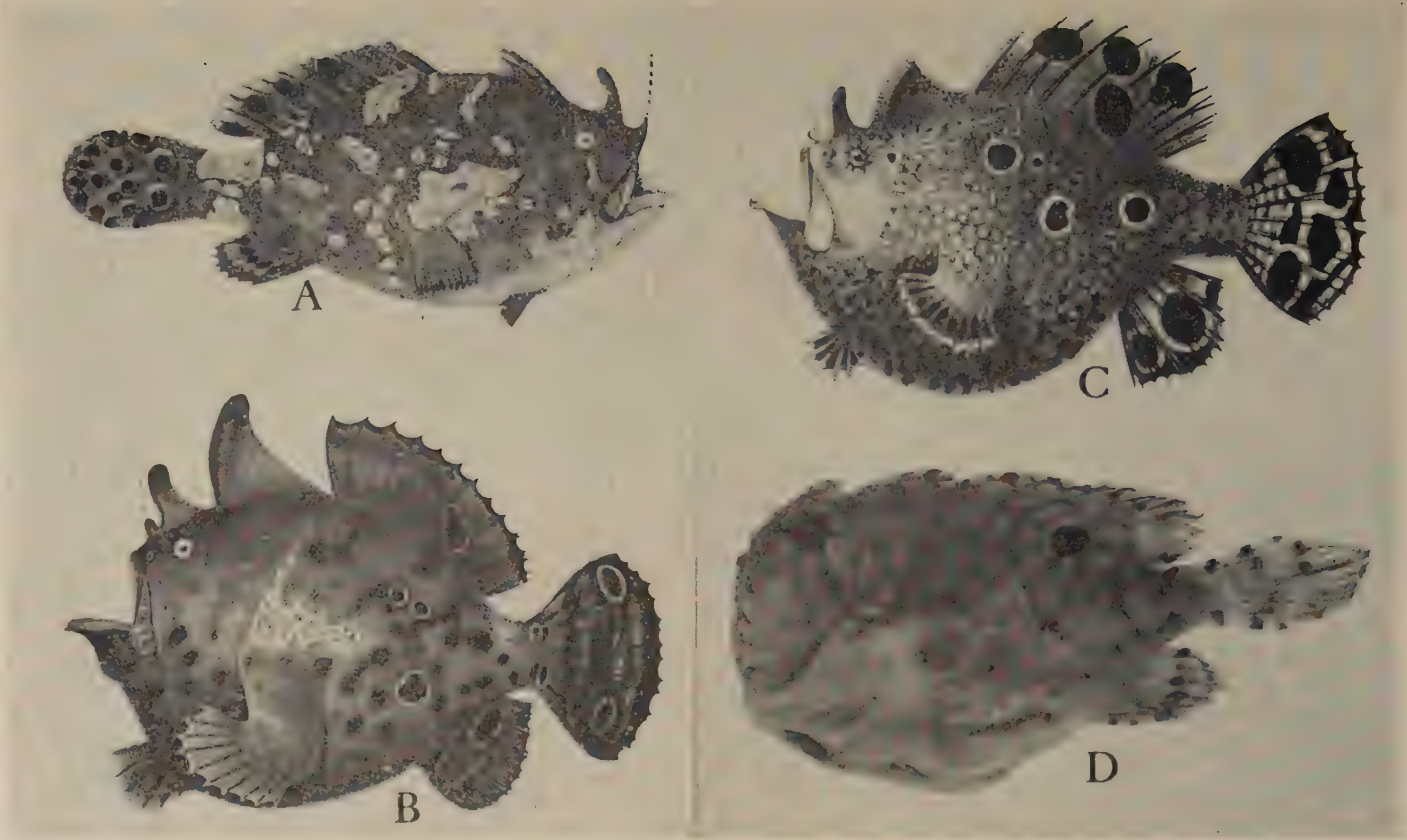
A, *Phyrnelox melas* (Bleeker), after Bleeker (Atlas, pl. 199, fig. 6). B, *Phrynelox güntheri* (Bleeker) may be *P. melas*, after Bleeker. C, *P. scaber* (Cuvier), after Poey 1853. D, *P. scaber* after Barbour 1942.



A, *Phrynelox cunninghami* (Fowler), after Fowler. B, *P. tridens* (Temminck and Schlegel), after authors. C, *Antennatus bigibbus* (Lacepède), after *Chironectes leprosus* Eydoux and Souleyet 1842. D, *A. bigibbus*, photo of CNHM 47648; first dorsal spine does not show.

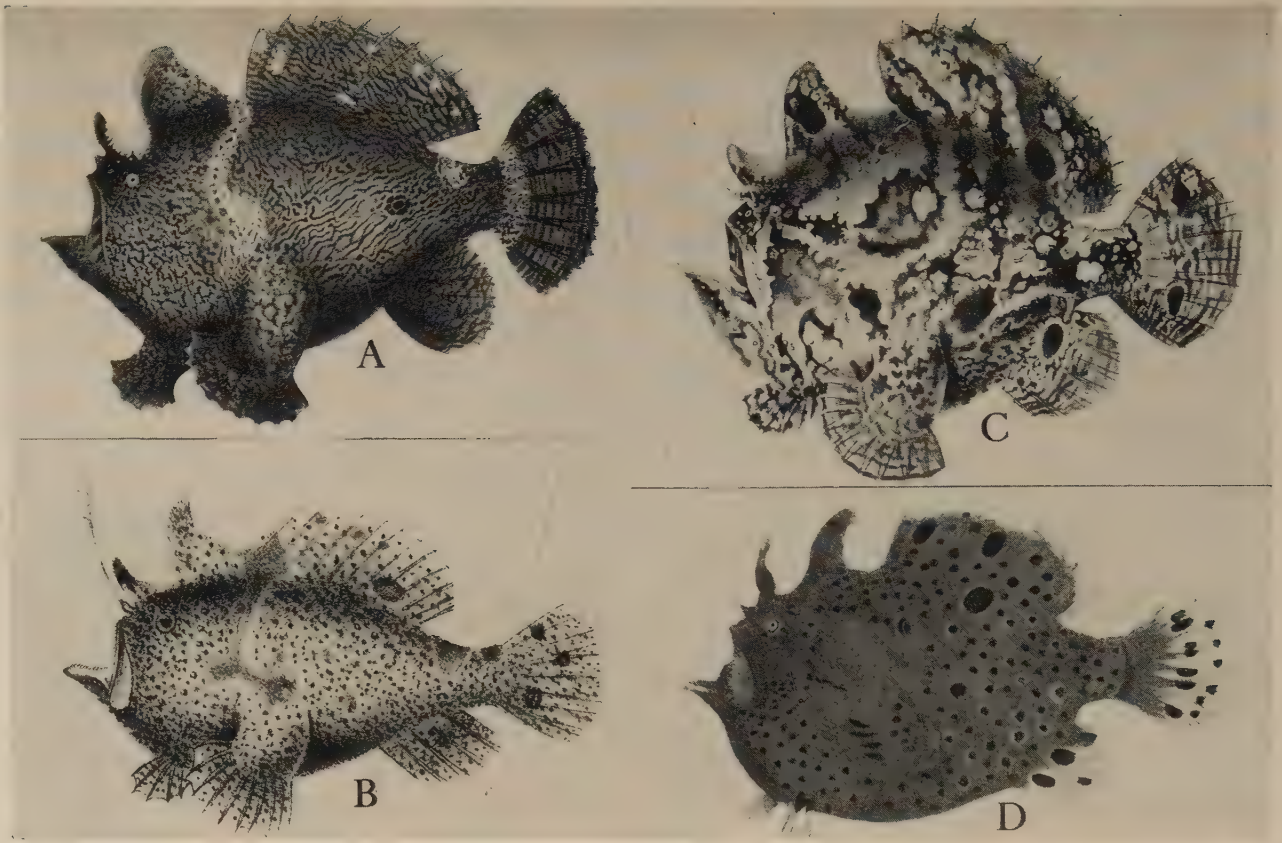


A, *Lophiocharon caudimaculatus* (Rüppell), after Bleeker. B, *Antennatus cryptacanthus* (Weber) after Weber. C, *A. strigatus* (Gill), photo of lectotype, USNM 6267. D, *Lophiocharon caudimaculatus*, photo of CNHM 21873.



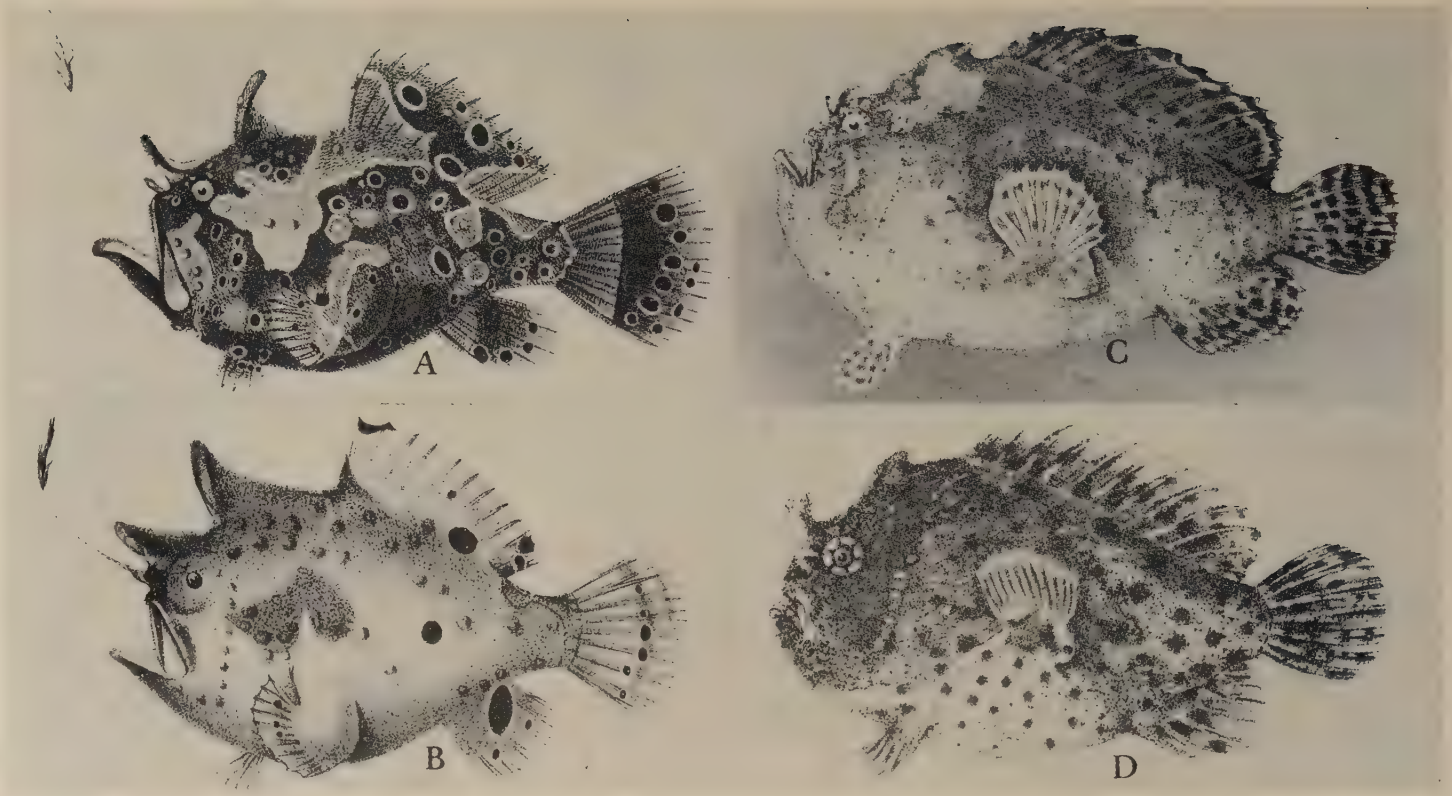
A, *Lophiocharon tenebrosus* (Poey), after Poey 1853. B, *L. horridus* (Bleeker), after Bleeker. C, *L. campylacanthus* (Bleeker), after Bleeker. D, *Antennarius radiosus* Garman, photo of USNM 155490.

A, *Antennarius sarasa* Tanaka, after Tanaka. B, *A. ocellatus* (Bloch and Schneider), photo of CNHM 45696. C, *A. asper* Macleay, after Richardson. D, *A. hispidus* (Bloch and Schneider), after Bleeker.

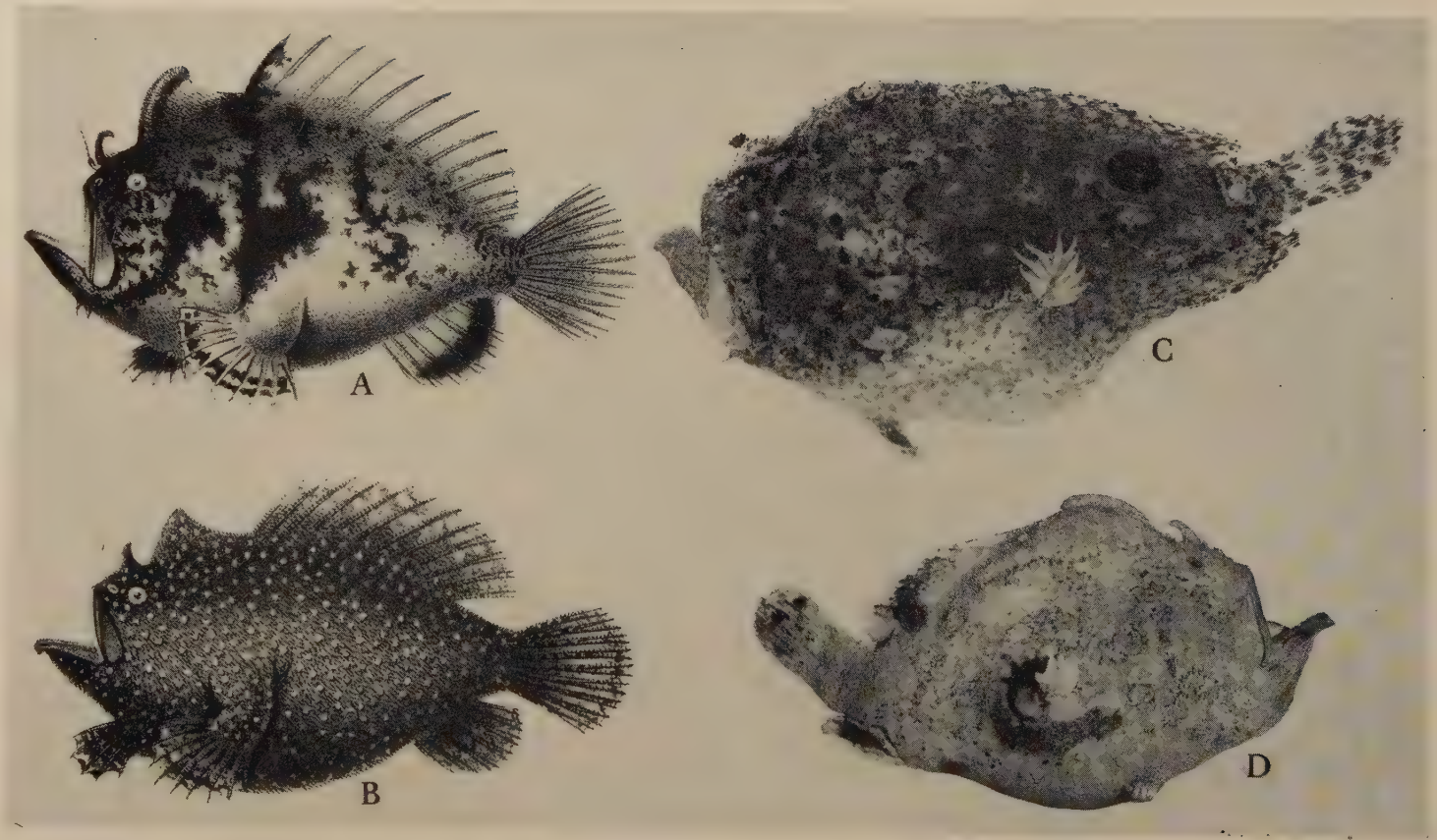


A and C, *Antennarius moluccensis* Bleeker (Atlas, vol. 5, pl. 196, fig. 2, and pl. 195, fig. 2). B, *A. leucosoma* Bleeker (Atlas, pl. 199, fig. 2). D, *A. pardalis* (Cuvier and Valenciennes), after authors.

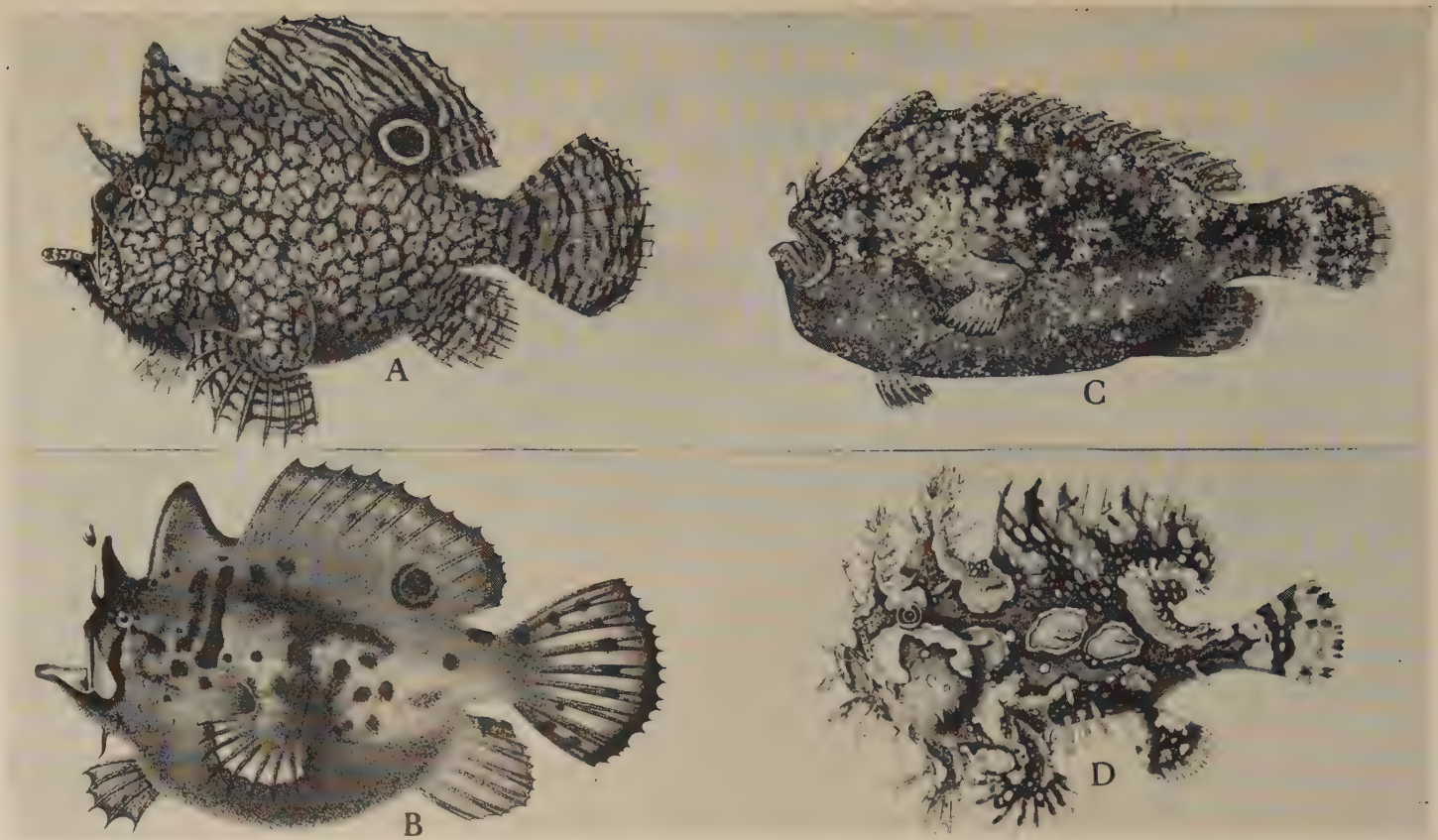
A and B, *Antennarius chironectes* Lacepède. A, black color phase after Bleeker (Atlas pl. 197 fig. 3); B, mottled color phase after Jordan and Evermann. C, *A. multiocellatus* (Cuvier and Valenciennes) after Barbour. D, *A. sanguineus* Gill, after Heller and Snodgrass.



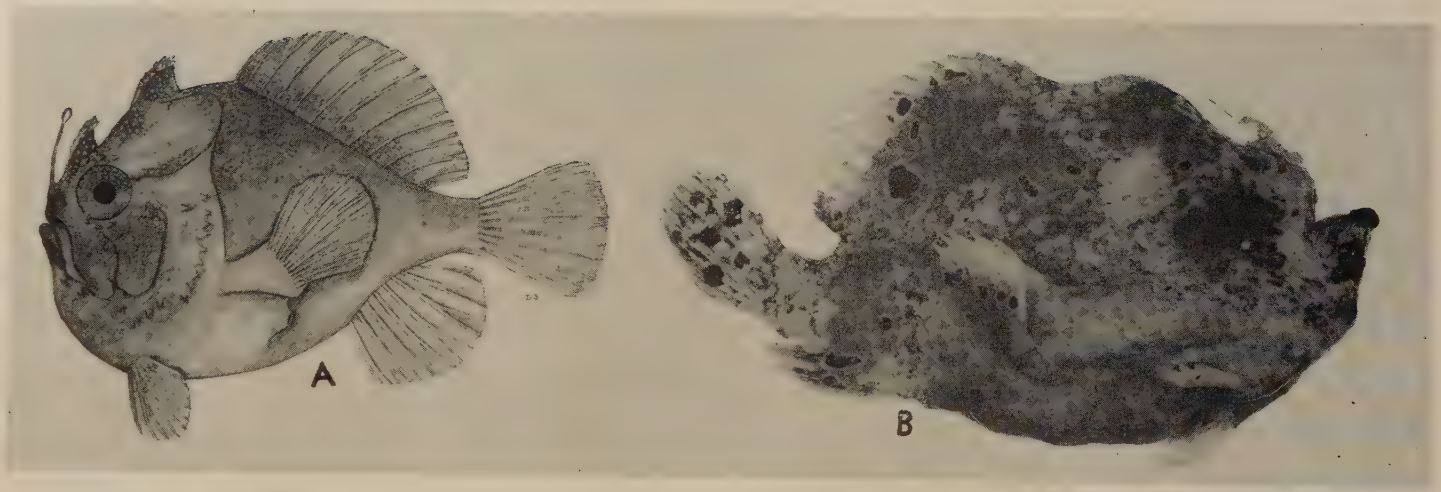
A, *Antennarius phymatodes* Bleeker, after Bleeker. B, *A. oligospilos* Bleeker, after Bleeker. C and D, *A. drombus* Jordan and Evermann: C, after Snyder; D, holotype, after Jordan and Evermann.



A, *Antennarius coccineus* (Lesson), after Bleeker. B, *A. dorehensis* Bleeker, after Bleeker. C, *A. bermudensis*, new species, photo of paratype of CNHM 48862. D, *A. verrucosus* Bean, holotype, CNHM 4853, photo courtesy of Chicago Natural History Museum.



A and B, *Antennarius notophthalmus* Bleeker, both after Bleeker. C, *A. altipinnis*, photo of drawing in Philippine *Albatross* collection of USNM 150939. D, *Histrio histrio* Linnaeus, after Longley and Hildebrand.



A, *Kanazawaichthys scutatus*, new species; drawing by Mrs. D. B. Schultz of holotype, USNM 157919, from Gulf of Mexico. B, *Lophiocharon tenebrosus* (Poey); photo of USNM 174940, from Florida.